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VOLUME XX NO. 3

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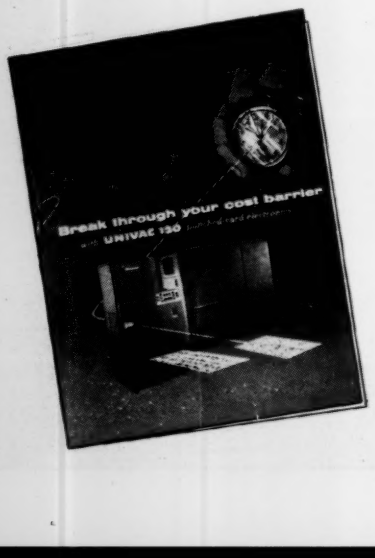

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Administration And Planning

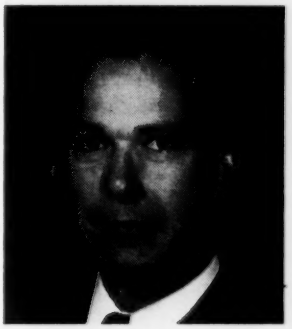
ANY discussion of planning is obscure and confused because of the great number of meanings of the term itself. A city plan at one time meant something fairly definite, but now even the city planners argue at length about "what is planning?" To an economist, planning may mean the exercise of administrative choices in the utilization of resources. Planning, to an administrator, may often mean the development of detailed estimates of work loads. In other instances, planning is that vague activity carried on by a division or a bureau of research, a process regarded by the administrator as a "good thing", but often neither well understood nor adequately utilized.

A special language of planning, often intelligible only to the initiated, seems to have been invented. Furthermore, the words of that special language seem to mean different things to different people. The word "planners" itself tended, during the past ten years, [1934-44] to become a term of opprobrium. During a major portion of that period, planning was likely to be linked primarily with social and economic theory, often of a radical nature. It was associated much of the time with the idea of long-haired professors or wild-eyed thinkers who removed themselves from the course of everyday life where planning was a natural thing, theorists who shut themselves in ivory towers to develop their own schemes for the complete salvation of man. Planners came to be considered as persons possessed of special powers of clairvoyance. This tended to set them apart from ordinary mortals. As a consequence, they were misunderstood and suspected.

Fortunately for the future of planning—particularly in administration—the ill repute in which planning has recently been held is rapidly disappearing. Today we find heads of corporations pleased to be called planners. We find labor leaders devoting much of their time frankly and proudly to planning, appraising the problems of the future and seeking solutions. We find within government a growing acknowledgement of the role of planning. We find the public less suspicious toward the word and the process, more understanding of the need of it. Although we still have far to go, we are definitely progressing in our understanding, acceptance and support of planning.

(From an address by Harold D. Smith, made before the Society for the Advancement of Management, Washington, D. C. Chapter. Reprinted from "Administration" by Albert Lepawsky.)

NEIL H. JACOBY was supervisor of the Legal & Research Division of the Department of Finance for Illinois from 1933 to 1936. He went from there to the same job with Lawrence Stern & Company, Chicago investment bankers, and from the Stern Company to the University of Chicago where he became Professor of Finance and Vice-President of the University. From 1948 to the present time he has been at U. S. L. A. He went on leave from this university job in 1953 to serve as a member of President Eisenhower's three-man Council of Economic Advisers.



How Public Economic Policies Affect Business Capital Expenditures

By Neil H. Jacoby
Professor and Dean
School of Business Administration
University of California
Member, The President's Council of Economic Advisors

Once we recognize clearly that the main source of improvement in our economic welfare is the size and excellence of the stock of tools and equipment which we put into the hands of our workers, there is no doubt that we shall give priority to public policies calculated to promote a sustained high rate of capital expenditure by business. This highly encouraging article, by an outstanding authority, lucidly describes our progress along this route.

DURING the course of these remarks I shall try to clarify and demonstrate the truth of several propositions.

Firstly, that expenditures by business enterprises on plant and equipment play a role of central importance in the growth and stability of the American economy, and should be a matter of deep interest to makers of public policy.

Secondly, that while the amount of plant and equipment expenditure by business firms is determined by numerous factors, long-term considerations appear to have become dominant during recent years.

Thirdly, that there is now no general "surplus" of plant and equipment in the United States, despite large wartime and defense outlays on manufacturing facilities; the current rate of spending for this purpose is in line with the present size of our economy and its normal growth requirements.

Fourthly, that governmental policies to help promote a high and sustained rate of plant and equipment expenditure in the future should focus upon measures to create public confidence in an expanding economy, free from serious depressions or inflations, and upon actions to accelerate the pace of technological progress.

When viewed simply as a proportion of total national expenditures, the outlays of business concerns on new plant and equipment do not appear to be very important. In 1954 they amounted to less than $27 billions in an aggregate gross national expenditure of $357 billions, or only 7.5 percent of the total. In other words, what we may call, for simplicity, "capital spending" by business amounted to about $1 out of each $15 of gross expenditure in the nation.

Capital spending during 1954—a typical year in this respect—was small in comparison with either personal consumption expenditure of $234 billions, or with Government expenditure on goods and services of nearly $78 billions. Yet there is no doubt that the dollars spent by business on plant and equipment were a more important determinant of the course of economic events than any equivalent amount of other expenditure. Plant and equipment expenditures are the heart of the process of economic growth. They hold the key to the business cycle—that rhythm of boom and depression which has caused our country great difficulty in the past. It will repay us to examine carefully the ways in which the flow of plant and equipment expenditure can be kept strong and steady in the future.

The outlays made by businesses on plant, equipment, and machinery are the very core of our economic growth. Unless the tools and equipment used by workers on farms, factories, mines, and offices are multiplied and improved, the average output per hour of work cannot increase much, if at all. Our hope for a better scale of living and more leisure in the future, as well as for the continued security of our nation in a troubled world, depends mainly upon increasing the productivity of human effort. And this, in turn, hinges principally upon the quantity and quality of mechanical power, tools and machinery which we provide to each productive worker. It is now well recognized that the high wages and living standards of Americans, which are the marvel of the world, result largely from the fact that the skills of the average American worker in agriculture and industry are backed by plant, tools, and equipment costing, in current prices, an average of

An address before the 7th Annual Engineering Institute of the University of California.

about $10,000 per worker. This is a figure vastly larger than its counterpart in any other industrialized nation.

Business expenditures on plant and equipment are also of prime importance in determining the relative stability of our economy and its freedom from booms and depressions. Dollars spent—or unspent—on capital goods are "high-powered" dollars, having a manifold influence on total demand and therefore on the health of the economy. For example, a decision to spend $1 million to build and equip a plant at a time when all resources are fully employed means that, during the process of completing the plant, $1 million additional spending power will be paid out to construction workers, equipment makers, an and contractors. They, in turn, will increase their demand for consumer goods and services; although there will be no increase in the supply of consumer goods and, in a fully-employed economy, there may even be a reduction in the supply if there is a transfer of manpower and resources from consumption goods to investment goods. Hence, a business decision to increase capital spending will be highly stimulative to the economy, in comparison with a business decision to increase by an equal amount outlays for the production of such consumer goods as shoes, or butter, or gasoline, since in the latter case both incomes and the supply of consumer goods will rise concomitantly. By the same token, a reduction in the rate of capital spending can have a sharp contractive effect. By reducing the demand for consumer goods at the same time that it tends to shift resources into their production, prices tend to fall, and a process of cumulative economic contraction may begin.

Capital Spending Steadier During Recent Recessions

Historically, business spending on new plant and equipment has been very unstable—up to recent times. During the Great Depression of 1929 to 1932 such spending fell by 75 percent. Between 1937 and 1938 it fell by 42 percent. In contrast, between 1948 and 1949 the reduction was 13 percent; between 1953 and 1954 it was only 6 percent. The greater stability of capital spending during the last two periods of cyclical contraction is a noteworthy tendency which helps to explain why these economic recessions were mild.

Granted that a strong and steady stream of business expenditure on plant and equipment is necessary to maintain a prosperous economy, how can the economic policies of government help bring this result about? To answer this question, we do well first of all to examine capital expenditure from the point of view of the business manager. What considerations lead him to buy new plant and equipment?

Reasons For Investment Spending

Students of business administration and finance have identified a number of reasons which lead business managers to invest in new plant and equipment. Some of these factors involve immediate or near-term considerations, the principal ones being the following: The percentage of productive capacity currently being utilized; the near-term prospect for sales; recent and prospective trends of profits; the amount of liquid assets held by the business; current costs of new equipment; interest rates and costs of borrowed money; and stock market prices and equity financing costs.

In addition to these short-term factors, a number of long-term motives underlie business investment. Current investment is influenced by a long-range capital plan involving an estimate of the firm's competitive position in its market five or ten or more years away. Business managers calculate on reducing costs and prices by taking advantage of equipment utilizing a new technique. They speculate upon improving the quality of their products through better processing apparatus. They add new products to the firm's line, rounding out the sales appeal to distributors. They seek to make their production processes more efficient, in many instances by acquiring highly-specialized machinery and even structures, which cuts the costs of mass-produced items. Or, they are obliged to match past or expected actions of a competitor to improve his market position by investment in the latest type of equipment.

There is persuasive evidence that more and more American business concerns are scheduling expenditures on plant and equipment by reference to long-term considerations. As a result, these expenditures in the aggregate are becoming less erratic through time than they have been in the past. Thus, when sales in many lines fell off after mid-1953, businessmen did not call a halt to investment in fixed facilities. Generally, they held to their long-term plans for modernizing, replacing, or expanding their machinery and their factory, store, and office buildings.

There are two basic reasons for a more stable rate of capital spending by business. In the first place, confidence has been rising among businessmen, as well as among other people, in the ability of the American economy to grow rapidly in the future and to avoid prolonged depressions and runaway inflations. In the second place, there has been a great increase in the amount of research and development activity, a quickening pace of technological change, and an intensification of competition among products of different kinds as well as among those of the same kind. These two fundamental forces have caused an increasing number of business firms to carry out systematic long-range capital expenditure plans.

Changes Reduce Vulnerability To Long Depressions

Businessmen are becoming increasingly aware of the great changes that have occurred in the United States economy during the past generation, changes which make the country less vulnerable to prolonged economic depressions. They have seen the beneficial influence upon their own markets of such factors as these: high and widely-distributed personal incomes and liquid savings; a flexible Federal revenue and expenditure system, which "cushions" changes in personal incomes; unemployment compensation; old-age pensions; deposit and home mortgage insurance; and farm price supports. Above all, business executives now generally appreciate the force of the Employment Act of 1946, which makes it an obligation of the Federal Government to use all practicable means within its power to foster and promote, under free competitive enterprise, "maximum employment, production and purchasing power." No wonder that the horizons of capital planning of all but small enterprises have lengthened. As a result of confidence in the prospect of economic expansion, long-term investment plans tend to be carried out steadily, despite intermediate dips in the business curve.

The other basic cause of well-sustained capital expenditures by business

is the fast pace of technological change in our country. This has been a consequence of the great expansion of research and development activities, in industry, in Government, and in the universities. The total amount of money expended during 1953 on basic and applied research in the sciences, and in the design, development, and testing of prototypes and processes, was estimated by the Council of Economic Advisers at $4 billions. The figure may have risen close to $5 billions in 1954. About half of this gigantic sum was spent by Government, largely in connection with national defense; most of the balance was expended by industry.

How Research Costs Affect The Economy

While it is generally known that research and development expenditures are increasing, the economic consequences of this increase are not so well understood. As research produces new scientific discoveries, and as science is applied to industry, new products are created, existing products are improved, and more efficient processes of production are developed requiring new equipment. Scientific research and development is, therefore, a great destroyer of the value of existing capital equipment, constantly eroding away apparent "excess capacity." By the same token, it is a great creator of demand for new capital goods. Not only does it tend to enlarge plant and equipment expenditures; it tends to stabilize them through time. Suppose one firm in an industry cuts its costs by re-equipping and making use of a new process. It then is able to cut its prices and take sales away from its competitors. The other firms in that industry will now have to make large capital outlays, in order to take advantage of the new process and to protect their positions in the market. For example, if petroleum company *A* produces high octane gasoline from a new refinery to meet the demands of motorists, then petroleum companies *B*, *C*, and *D* are likely to spend hundreds of millions of dollars on new refining equipment simply as a defensive measure to meet this threat to their market positions. Technological change makes much capital spending by business compulsory, and not optional, in a very real sense. This process continues through good times and bad.

It has been argued by some persons that business will not continue to spend money on plant and equipment at the current level, and that expenditures will fall off and be a drag on the economy for a number of years. These persons reason as follows: During World War II huge expenditures were made on manufacturing facilities by the Defense Plant Corporation as well as by private enterprises. These outlays were followed, not long after, by further extraordinary plant and equipment expenditures under the stimulus of military contracts for the Korean conflict and the subsequent defense build-up. Unusual stimulation was also given by the five-year write-off permitted under the tax laws of new facilities deemed essential for the national defense. Now that these extraordinary sources of demand for capital equipment have waned, and these unusual stimuli to their production have diminished, several years will be needed by the economy to absorb or "grow up" to the current surplusage of capital facilities. Hence, the current level of capital spending is not sustainable. So runs the argument.

Although one cannot deny the presence during the past decade of extraordinary stimuli to sales of capital goods, the conclusion that demand will fall off, from this point on, does not necessarily follow. Indeed, the facts appear to warrant the opposite conclusion. The current rate of capital spending is not only sustainable but is capable of considerable increase, *if* public policies favor rapid economic growth and vigorous technological development.

Demand For Capital Goods Will Keep Rising

Studies by the Machinery Institute reach the conclusion that since 1940 there has been an increase of about 110 percent in the nation's stock of machinery and equipment, of about 20 percent in the amount of plant, and of about 50 percent in the two categories of capital investment combined. These are "real" and not dollar increments. The rate of utilization of the nation's stock of plant and equipment, according to these studies, was well *above* normal during the war period. Large postwar investments by business have served merely to restore normal rates of utilization, and to make good the long period of under-investment during the depressed Thirties. Currently the national stock of plant and equipment is expanding at a little more than 3 percent a year, a rate well in line with the normal growth of aggregate national production. Moreover, retirements of industrial equipment from service recently have been unusually low, because of the comparative "freshness" of much of the stock. During the years ahead, normal retirements may be expected to increase. This is an excellent augury for a rising demand for capital goods.

The prospect for financing a rising volume of expenditures on capital goods appears favorable. Depreciation allowances are now increasing by more than 3 percent a year. Generous depreciation allowances are available under the 1954 Tax Revision Act. The current financial position of business is, in general, excellent. Credit is readily available. The rise in stock prices has made equity money once more available on a reasonable basis to many businesses, as the announced $300 million stock issue by General Motors Corporation illustrates.

One may conclude that basic economic forces are favorable to a sustained and rising level of capital expenditure by business. There is no large postwar "surplus" of productive capacity to be "absorbed" before progress may be resumed. But we should not permit our thinking to be bound by historical relationships. The dominant factor in the future demand for capital goods will be the vigor of our economy and the climate for private investment. These are matters of public policy that lie within our own control.

Our analysis points plainly to the kinds of economic policies by which government can help bring about a high and sustained rate of plant and equip-

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ment expenditure by business. It indicates that the broad objects of such policies must be: in the first place, to foster an attitude of confidence among businessmen and other people in an economic future that is expansionary and free from paralyzing depressions or inflations; in the second place, to accelerate the rate of technological development and industrial innovation.

An Economic Policy For Growth And Stability

The first objective—to extend the horizons of business planning by cultivating an attitude of confidence in the economic future—obviously covers a multitude of possible measures. Rather than try to describe them all, we may recall the basic tenets upon which an economic policy for growth and stability of the American economy should be based. I am unable to formulate these tenets more simply and effectively than they have been stated in the January 1955 Economic Report of the President:

> *"The role of the Federal Government in the achievement of [our] goals is to create an atmosphere favorable to economic activity by encouraging private initiative, curbing monopolistic tendencies, avoiding encroachment on the private sector of the economy, and carrying out as much of its own work as is practicable through private enterprise. It should take its full part at the side of State and local governments in providing appropriate public facilities. It should restrain tendencies toward recession or inflation. It should widen opportunities for less fortunate citizens, and help individuals to cope with the hazards of unemployment, illness, old age, and blighted neighborhoods."*

The legislative and administrative acts of government should aim to extend the application of these tenets in future years, continuing the progress that has been made in the recent past.

The second objective of public policy is to accelerate the rate of technological progress and industrial innovation. Actions are required on several fronts:

(1) To augment the number of young people who have scientific, engineering, managerial and technical skill.

(2) To encourage creative thinking and invention, mainly by appropriate patent and tax laws.

(3) To induce business firms and non-profit organizations to support expanding programs of basic scientific research.

(4) To enlarge the range and depth of Federal research and development programs in fields that cannot be covered adequately by private efforts.

(5) To hasten the industrial application of new methods and ideas by encouraging the replacement of old plant and equipment, and by fostering risk-taking investment in a competitive environment.

Let us glance briefly down each of these avenues of policy to see where we now stand and what specific problems confront us.

We must augment the number of young people who have scientific, engineering, managerial and technical skill. A shortage of young men and women trained in these fields now exists. Unless it is relieved, it may limit the growth of research activity and retard its industrial application. Congress has been asked this year to expand the fellowship, research, and teacher-training program of the National Science Foundation. But the problem needs to be tackled farther back in our educational system —at the high shool and even the grade school level. Technological progress cannot be expected unless our human resources are developed for these tasks.

Improved Patent System Encourages Creative Thinking

Creative thinking and invention can be encouraged by making sure that our patent system gives rapid and effective protection to the inventor, and that our tax system does not so heavily burden his income as to dull his incentive to creative effort. The number of non-processed applications for patents in the Patent Office is approaching 200,000, and it now takes about 3½ years to process an application. It may be wise for Congress to provide the Patent Office with the funds necessary to reduce both the backlog and the processing time. Consideration should also be given to modernizing the system of classifying patents in the light of contemporary science. So far as personal taxes are concerned, we must hope for economic growth and a quieter world of reduced military expenditure, making possible a reduction of present tax burdens.

The Federal Government has already taken important steps to encourage research and development activities by business firms and non-profit organizations. The tax laws now offer strong encouragement to wealthy persons to transfer their property to non-profit foundations which can and should support basic scientific inquiries. Last year the tax laws were revised to permit businesses to treat all outlays for research as current expenses. With a current corporate tax rate of 52 percent, this means that the Federal Government, in effect, makes a major contribution to the research and development program of a profitable business. The new Atomic Energy Act authorizes the Atomic Energy Commission to license the use of nuclear material in privately-owned reactors, and it broadens substantially patent protection for private investors in the atomic energy field. The door to competitive enterprise in the industrial use of atomic energy has been opened.

More Government Spending For Research and Development

The Federal Government itself plans to spend more money on scientific research and development during the coming fiscal year than at any time in the past in fields not adequately covered by private efforts. The Budget Message for the fiscal year 1956 puts these outlays at $2,218 millions—a 7 percent increase over those made during the current fiscal year—despite an over-all reduction in governmental expenditures. Nevertheless, there are fields of research activity which may well deserve greater Federal attention, such as the basic physics and geology of petroleum and mineral deposits, water and air pollution control, and the development of solar and tidal power.

The industrial application of new methods and ideas has been hastened by recent structural revisions of our tax laws, and by other measures to invigorate enterprise. Depreciation allowances were liberalized; the period over which business losses could be carried back for tax purposes was lengthened; the ploughing-back of earnings for expansion was facilitated; a limited tax credit on dividends received by shareholders was granted. Yet there are additional steps along the same path that may well deserve consideration at the proper time in the future. They include revisions in the taxation of capital gains, a privilege of rapid write-off of a limited amount of new property each year, and a further extension of the period for which losses may be carried back. END

ULLMAN ROSENFIELD began his career in personnel work as Assistant Placement Manager with the N. Y. State Employment Service in New York City, in 1937. From 1943-45 he was assistant area Director of the War Manpower Commission in New York. He left that position to become Personnel Director of Executone Inc., New York City. In 1951 he became Personnel Director of Etched Products Corporation, Long Island City.

Are We Asking The Foreman To Be Better Than His Supervisor?

by U. Rosenfield
Personnel Director
The Etched Products Corporation
Long Island City, N. Y.

Along with middle and top executives, the foreman has been swept into training programs with little consideration of his needs and his problems. About the only thing management agrees on is that the foreman must get out the production—in spite of any training he gets. Here is an article that challenges the myth that training is all the foreman needs to become an industrial superman.

IN FACTORY after factory all over the country the progress in personnel relations amounts to a second industrial revolution. Firms of every description are outdoing each other in their recognition of and dealing with the "human" qualities of their rank and file employees. The results, when measured in terms of cost reduction, are every bit as remarkable as were the results of introducing machinery, which marked the earlier revolution.

Largely overlooked by most firms, however, is the fact that its supervisory employees are just as "human" as the rank and file. Foremen, for example, are widely and quite properly looked upon as front line instruments of management policy. Because everything must funnel through the foreman, he is expected to be a production wizard, a psychologist and teacher, a safety and industrial engineer all rolled into one.

But, how realistic are these expectations? Foremen are not supermen, but human beings, too; and the new approach in human relations needs to be applied *to* foremen as well as *by* them. The foreman's "boss" needs to manage his men with a stimulating and inspirational type of leadership, its lofty objectives tempered by a realistic appreciation of the laws of human psychology and their effect upon the manner and rate of growth on the part of individual foremen. Line supervisors from the chief executive down must be trained until mastery is achieved and practiced in this more fruitful style of leadership. With this approach we may be able to break through the barrier which, until now, has so limited the practical effectiveness of foreman training.

The foregoing conclusions are the fruit of the writer's experience in the field of improving foreman performance on the job. Whether working with an individual foreman in his department, or conducting problem solving conferences, or teaching a class in industrial psychology the writer has always been struck by the discouraging failure to help the average foreman achieve more than a spotty and temporary improvement on the job. The reason for such failure was elusively hidden. One thing was sure: If the pupils hadn't learned, the teacher hadn't taught. With this in mind the writer set out to do an even better job of teaching. For eighteen months in one factory he conducted carefully planned weekly foremen conferences. The subject matter was decided by the foremen themselves to obtain better motivation. Careful attention was given to praising success and giving social approval to achievement. Use of the techniques of discussion, committee work, role playing, and actual tryout on the job afforded practice in thinking and talking about and using the new skills we were trying to teach.

There was, during the period, a growing improvement in esprit de corps, in co-operation, and in mutual understanding. Improvement in work performance, however, was far less tangible. The attention of a foreman here or there was briefly diverted to clean-up, to safety, or to methods improvement. Soon, however, "more-pressing" matters made him a prisoner again; and the joys of new adventure and achievement were for the most part forgotten. Over and over the experience followed this pattern: The lesson had been successfully taught; the technique had been mastered; the foreman was using it. Then he stopped; the skill fell into disuse; the training had had no lasting effect upon performance.

Other persons learn and grow through participation in classroom and other types of instruction. Why not foremen?

Still perplexed, the writer turned to the literature. A publication of the Harvard Business School Division of Research was rewarding reading. *Foreman Training in a Growing Enterprise,* by A. Zaleznik, describes the same failure of the most advanced training techniques. The foreman is described as "an administrator who must get things done." Obviously, unless training helps him get things done, he cannot be expected to give it more than passing attention.

This plight of the training people brings to mind the itinerant salesman of books on agricultural science: The farmer rejected his offerings, saying, "Young feller, I don't farm even as good as I already know how to!" Perhaps the foreman, too, sees little value in reading and studying about new skills when he already doesn't do as well as he knows how. Perhaps this is what foreman Joe Green was trying to say when he spoke up at a training session on *Motion Economy.* "Frank," he said to his superintendent, "we know this stuff, but we're only human. We get in a rut. You have to jack us up once in a while."

Thinking about this foreman's insight, the writer decided to seek his answer from the oracle himself. Perhaps foremen can tell why they do not do as well as they know how. Since our training merely seeks to give them more know-how, the same reason which might explain failure to use old skills would also explain the failure to use newly trained skills.

Get Out Production The Main Theme

With this in mind the writer interviewed a number of foremen to see what they had to say about themselves and their jobs. One at a time they were invited into a small private office to "talk about your job" with the writer. The atmosphere was informal, and they were assured that their remarks would be kept in the strictest confidence. Some spoke freely, but others had to be drawn out, with close questioning to obtain their views on:

1) What are you expected to do?
2) How well do you think you are doing?
3) Why aren't you doing as well as you know how?

There was a surprising agreement on the belief that a foreman is expected to meet his production schedule. The effect of past training efforts was reflected in many side references to quality, safety, costs, happy employees, layout, methods; but the dominant theme was "get out the production!".

This was pointed up dramatically by one foreman who related a conversation with his boss, who had promised to ship that very day 1000 pieces to a very important customer. Something had gone wrong and each piece had a defect which the foreman was sure would not pass the customer's inspection. The boss "blew his top" then ordered, "Ship them anyhow! I promised to deliver today; and we'll do it, even if the whole shipment comes back." Significantly, the foreman observed, "I knew then that I could make the boss happy if I always turned out the work regardless of cost or quality defects!"

On the whole the foremen did not feel that they were doing their best, although some felt that they did the best they could under the circumstances. Pursuit of what they meant by "under the circumstances" led directly to discussion of why they felt they couldn't do as well as they felt able. It was in this area that the interviewer hoped to find some help in identifying the baffling barrier to foreman growth. The answers came tumbling out; and they were written down just as they came, in the foremen's own language. We studied these responses to discover what the foremen were trying to say. What were their complaints? Let us look at those most frequently mentioned, arranged according to whether they blamed themselves, others, or things:

THEMSELVES:
I guess I'm lazy!
One man can't do everything.
I get in a rut!
I can't find time.
Maybe I'm no good.
I guess I'm not as good as I thought.

OTHERS:
That boy won't listen.
Too many bosses.
My operators "goof off".
Boss won't listen.
It takes too long to get things fixed.
Too many interruptions.

THINGS:
The material is no good.
Machines are worn out.
The conveyor is dirty.
The room temperature can't be controlled.
It's too damp in here.
The floor is uneven.

Analysis of these three categories of responses led to the realization that even when foremen blame "things" they are really blaming the people (themselves or others) who could or should see to it that the faulty "things" are corrected. Thus, in the last analysis foremen blame either themselves or other people when explaining why they do not do their best.

"Other people" may, for convenience, be divided into three groups: (1) subordinates, (2) co-workers, and (3) superiors (management—the boss). In order, then, for a foreman to overcome the obstacles to his success he need only to learn how to manage himself, his subordinates, his co-workers, and his boss.

Can Any Supervisor Do Everything We Teach The Foreman?

With the blessings of management most of us training experts center our attention upon the foreman. We teach him the psychology he must apply to his employees, his co-workers, and his boss to get each person to do pretty much what he wants him to. We teach him how to organize his time so that he can get everything done, letting nothing discourage or sidetrack him. We teach him how to analyze his needs and encourage him to fight intelligently for repairs, equipment, good material and tools. We show him how to study costs and, through improving methods and controlling quality, save the company money. We tell him that his irresistible skills will conquer all.

And what do we find? The foreman responds by saying, "Yes, it's my fault. I'm no good!" But, in the same breath, he also says," The boss won't listen. The boss interrupts too much. It takes too long to get things fixed, etc." If we listen to these foremen, we may learn something about the problem which is vexing us.

Do we realize that the beautiful picture of the successful foreman, which we so skillfully painted, is actually a wholly unreal and impossible superhuman composite of the good practices found in each of hundreds of partially successful foremen studied by the experts? Do we realize that our foreman, being only human, cannot possibly do as well as we have taught him to? Some of the poor fellows are telling us that they feel their inadequacy and feel discouraged, guilty. Their unconscious resentment of the training which gave rise

to these uncomfortable feelings may in some measure account for the efforts of many foremen to avoid attendance at training sessions.

Not all foremen have this guilt reaction, however. With the normal human instinct for preservation of self-respect, they just refuse to "buy" the notion that they must become irresistible supermen. They are interested in the classroom activities and show a ready understanding of the material. They may even demonstrate mastery of the skills being taught and make a stab at putting some of them to use. But they do not take it too seriously. Somehow they know that the day contains only eight hours, that bad material and equipment are frequently their lot despite anything they may try to do about it, that some of their co-workers and employees cannot be appealed to, and that the boss must be pleased rather than managed most of the time.

This practical attitude imparts to such foremen a striking resemblance to well-fed gourmets at a banquet. Because the food for thought is so temptingly prepared they taste a little of everything—enough not to offend the chef and to make sure that they haven't missed anything really good. Only occasionally, when carried away by the special appeal of some tempting concoction, do they eat heartily. Then, more than likely, they later experience discomfort until they return to normal.

These, then, are the things that are inhibiting the foreman's growth: discouragement and cynical disbelief. They even inhibit his full use of already mastered skills. If we can find ways to avoid discouragement and dissolve cynicism, perhaps we can at the same time discover how to encourage fuller use of already acquired know-how and, along with it, the acquisition and use of new know-how.

The Supervisor Often The Barrier To Foreman Growth

Language such as *growth inhibiting* and *growth encouraging* is borrowed from the science of educational psychology, which has given so much to the education of our children. Perhaps we have been breaking some basic laws of learning in our efforts to educate our foremen. Defy the law of gravity and you will fall to the ground. Violate the less obvious but nonetheless important laws of learning, and learning—growth —may be seriously stunted. What, then, are the laws of learning?

1. The Law of *EXERCISE:* We tend to learn by repetition, repetition of hearing, seeing, feeling, talking about, doing.
2. The Law of *EFFECT:* We tend to learn to do those things which bring us pleasure and not to do those things which bring us discomfort or pain.
3. The Law of *READINESS:* We tend to learn what we are ready to learn, when we feel motivated by a need or desire to learn.

Incentive, Practice, Satisfaction —Keys To Supervisor's Development

The training people know these laws and use them. They go to great pains to teach what foremen say they want to learn and to keep interest high by dramatic presentations and motivating discussions. They try to give plenty of opportunity for practice of a new skill and to make success pleasant in terms of praise, recognition and a sense of accomplishment. They use the laws of learning as teachers would use them; but they will never break through the barrier to foreman growth until they teach the foreman's supervisor to use the laws of learning as a leader should use them. Only his supervisor can really stimulate a foreman to do a better job, to try to use a new skill while he continues to use all of his old skills. Only his supervisor can reward the foreman's efforts with interest and understanding, support and sympathy. There is a place for group training of foremen—to supplement the efforts of supervisors. The major training effort should be to equip line supervisors, from chief executive down, with the techniques of executive leadership and the ability to apply the laws of learning in their efforts to help their subordinates grow.

Our courses in supervision, or executive leadership, must avoid the mistakes of our courses in foremanship. We cannot teach each skill separately and in rapid succession as we teach the separate "facts" of addition, subtraction, multiplication, and division. A supervisor at work is more like a juggler who wants to learn to work with more than three balls. If you toss him a fourth ball, a fifth, a sixth, and a seventh in rapid succession, he will at best and just as rapidly drop, one by one, those already in use. He has had no time to master keeping 4, 5, 6, or 7 balls going at one time; so he either must ignore the new balls and let them fall, or he must drop an old ball every time a new one arrives, or he must drop them all in utter confusion.

Furthermore, unless he very much wants to expand his act, he will remain a three-ball juggler until he dies. Assuming native ability, it takes incentive (readiness), practice (exercise) and satisfaction with the results (effect) to turn him into a virtuoso.

Just so, the successful supervisor or successful foreman we envisage is a virtuoso in his field. We must help him achieve mastery in specific skills and go on to help him absorb each new skill without discarding or neglecting those he already uses well. We must afford the opportunity to exercise the difficult art of including the use of each new skill in an already full and hectic work schedule. And we must never lose sight of the fact that it takes incentive, practice, and satisfaction with the results to insure growth.

All of this is easier said than done. Toward this end each line supervisor must be trained to exercise the following minimum skills:

(1) Find out what is expected of you by your supervisor.

(2) Decide what you yourself want to do in your job *in addition to* what is expected of you.

(3) Divide your work into (a) that part you must or want to do yourself and (b) that part you will ask others to do for you under your supervision.

(4) Divide your time into (a) doing your part and (b) super-

Only his supervisor can really stimulate a foreman to do a better job. . . .

vising the work of those who are helping you.

(5) Make sure that each of your subordinates understands what you expect of him. If you want him to concern himself with human relations, cost control, safety, and other matters in addition to the all-important production, you must show, by example, that these areas are getting your attention, too.

(6) Study the performance of each subordinate until you know which areas of his job he does well and which he does poorly or neglects altogether. Make him aware of your approval of his performance in the satisfactory areas.

(7) For each subordinate choose a single area of poorest performance and let him know that you are dissatisfied and are going to help him expand his mastery to include the neglected area. This assures his readiness to learn. If he knows that he cannot avoid doing something about lateness of his employees, for example, he will be "ready" to read pamphlets and go to lectures on lateness control.

(8) See to it that each subordinate is supplied with reading material about the neglected area, special training, and assistance from staff experts. This helps him achieve the know-how.

(9) Encourage him to use the new know-how by discussing with him his experiences in trying to apply it. Help him maintain balance by reviewing at the same discussion his performance in already mastered areas. Let him see that you want him to master the new area without losing mastery of the older ones. If he has difficulty or cannot find the time to practice his enlarged responsibility, you must take the time yourself to teach him how to plan his time so as to get everything done. This assures practice and makes use of the Law of Exercise.

(10) If you find his time used up by too many emergencies and too many bosses, be mature enough to study your own job performance and see to it that he has only one supervisor—yourself. Perhaps more careful planning can reduce the frequency of emergencies, too. No one can do a good job just meeting emergencies.

(11) Above all, as he recommends changes, purchases, raises for his subordinates, etc., in his effort to do his job as you want him to, you should study his recommendations seriously and support him with your approval if it is at all possible. If not, you should take the time and trouble to explain to him why your approval is not possible and to guide his thinking into areas which you will be able to support. This assures his enjoyment of his relationship with you and makes use of the law of effect.

(12) If your subordinate also has the job of leadership of other supervisors, make sure that mastery of such leadership is your first area of supervisory work with him; and teach him to do the same with his subordinates. In this fashion the skill will quickly flow through the organization.

An organization with effective executive leaders in each level of management will create the climate in which all supervisors, including foremen, can grow in every expanding mastery of their jobs. Not even the chief executive is a superman, and the lower one descends on the management ladder, the more one encounters the human qualities of supervisors, the qualities which makes a man depend upon leadership for growth and accomplishment. The greatest emphasis of the training people should be placed upon the role of the immediate supervisor of foremen. By recognizing the human limitations of his men and applying the human laws of growth, this key executive can provide the motivation, the practice, and the satisfaction which, coupled with supplementary training, will insure development on the part of each foreman—one step at a time.

Such a program requires: (1) Top management support on a continuing basis; (2) Meetings and conferences of supervisors to foster esprit de corps and mutual understanding; (3) Training of foremen on a supplementary basis; (4) Training of supervisors in executive leadership; and (5) Tough-minded recognition that not every man can learn to be an effective leader, and disposition to eliminate from leadership positions those who cannot or will not learn to lead effectively. END

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Professor E. H. ANDERSON began his career as a management trainee with the Chesapeake and Potomac Telephone Company. His next job was junior salesman for the Kardex Rand Company. Then he became an accounting clerk for Citizens Investment Trust Company. His teaching career began as assistant professor of Business Administration at Furman University, from 1934-36. He taught Business Administration at New York University the three following years, before going to the University of Alabama.

The Complex Problem of Organization

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Organization is a many-sided problem. There is the division and combination of tasks to make jobs and departments. There is also division and combination of people to make specialists and teams. Here is a basic analysis that clearly delineates the issues and offers an approach to competent solution of the problem.

IN THE literature of organization there is still much confusion in both terminology and ideology. For example:

Of a subject talked about as much as organization, it seems strange to have to plead that it is *a subject. . . . I fear we assume too readily that what has a name has, therefore, a being. This name, organization, implies a body of knowledge. Where is that body of knowledge. . . ?*

My concern is about a lack of classification as a cause of lack of understanding. And this lack of understanding seems plainly to come from a lack of classification or lack of definition.[1]

Another author, however, may be somewhat more optimistic. He believes that organization "*. . . now has all the superficial traits of a science, including a full set of theorems, principles, dogmatists and disputes.*"[2]

It seems worthwhile, therefore, to examine, or re-examine, some of the terms and concepts used in explaining the subject of organization, especially some of its more confused aspects. It is only when students can come to a working agreement on concepts and basic processes that they can build lastingly on one another's work. And it is only when managers can make their organization structures understandable and logical to their employees that the rank and file can fit themselves into the plan and perform effectively the roles assigned to them.

The dictionary defines an organization as "*the executive structure of a business*"; also as "the personnel of management."[3]

The essence of the first of these meanings is perhaps best contained in the philosophical definition of the kindred word "organism." According to Webster, it is "*Any highly complex thing or structure with parts so integrated that their relation to one another is governed by their relation to the whole.*"[4] Thus, an organism (or in this case an organization) is made up of two basic components: parts and relationships.[5]

Consideration of these two components—how they are developed and how they are related to each other—seems to offer, therefore, a fruitful approach to a better comprehension of the subject.

The parts of an organization are the jobs and positions found to be necessary for performing the work of the enterprise, or the organization as a whole. They depend for their existence upon the nature of the work to be done and vary, therefore, from one enterprise to another. When specific persons are placed in these positions, each with his functions shown and his relationships to others indicated, they, taken collectively, may be said to "personify the organization." They represent the organization in the concrete, or, more literally, in the flesh; the chart and its general scheme of positions and relationships represent the organization structurally, or in the abstract. The several strata of persons indicated as holding positions of a supervisory nature constitute what was referred to in the definition quoted as "the personnel of management." The word "organization" connotes, therefore, something more specific than "personnel." Its concern is with the integration of personnel into a framework of jobs and relationships that constitutes a smoothly functioning team for the accomplishment of the objectives of the enterprise.

The process of constructing jobs consists of two distinct phases or steps: division and combination. Division consists of analyzing the work to be done and breaking it down into elemental

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units of activity—even down to individual motions or therbligs should this be appropriate.[6] Combination consists of putting these units back together again in a way that will build jobs, or units of work suitable for human performance.

Division in organization arises from two main causes. The first is that of mere size. The big task—too big for one person to perform effectively alone—is made small by division and subdivision into jobs and positions. The second cause arises from the advantages of specialization, or division of labor. The foreknowledge of the advantages of specialization and functionalization often leads to the combining of units of work into large aggregates which seem to offer possibilities for re-division and distribution among jobs on a more effective basis. Large aggregates, naturally, permit of greater division and specialization in both degree and kind. It is this scheme or structure of division and subdivision which permits the chief executive of a large organization to trace down the ramified lines of his organization chart and locate the activities of the enterprise and the personnel accountable for their performance.

Combination in job building begins after analysis and division have been completed and proceeds to take the divided parts of the work of the enterprise and regroup them for the purpose of forming units of work more suitable from the personnel point of view. It may be necessary in some cases to modify the results of a logical division. This step, unlike the former steps, proceeds by addition and combination rather than by division and sub-division. Its purpose is to bring together activities related by sequence, homogeneity or otherwise, along with items of information that may be necessary, so as to form a balanced body of work suitable for assignment to a person as his job. In it consideration must be given to factors which might not have been considered in carrying out the process of division, such as: the particular aptitudes, skills and knowledge of the personnel; the opportunity afforded them for variety, learning and occupational growth; the measurability of individual output and efficiency; freedom from avoidable dependence upon or interference by others; and the kind and amount of assistance and supervision needed for each task.

Factors To Consider When Combining Tasks

The problem of constructing jobs, correct from the point of view of both production and personnel, is one frequently overlooked by organizers and often obscured by elaborate schemes of division and functionalization. It is for this reason that the chief executive himself often fails to understand why many of the members of his organization do not properly carry out their respective functions. Much harping upon employees' lack of initiative, in efficiency, in reliability, and lack of cooperation might be avoided by re-studying in detail the content of their respective jobs. It is this failure of the executive and the worker each to see a job as the same thing, the same set of activities surrounded by the same set of conditions, that makes a better comprehension of the concepts and processes of organization essential.

The problem is one of the general limitation of all formal organization. It has been described by another author, as follows:

> *No executive who has worked for a large corporation needs to be told that there is a vast difference between the way such a company is managed and the way this process is commonly described. The statement that the president "runs" the company and is "assisted" by everyone under him is a fiction recognized by any manager who has experienced the politics and personalities of top management. The fiction is perpetuated in management's reverence for the titles and functions of corporate hierarchy, and is officially transcribed on the orthodox organization chart whose neat little boxes and connecting lines strive to show who is running what and who reports to whom.*[7]

Probably one of the greatest errors in job building, especially in recent years, is the error of applying the principle of division of labor too far.[8] The advantages of the principle having been proven, the principle is then applied to every situation, apparently without limit. In many cases jobs have been reduced in content to the exact repetition of a few simple motions all day long. Even a moron, it seems, would find such a job stupefying. The situation is as bad when jobs already filled by competent workers are simplified or diluted in a way that will require less knowledge and skill of the incumbent worker. A worker who has proven his competency, and demonstrated his potentiality, usually wants something more challenging to do, not less. Thus the very simplicity that makes a job easy may at the same time make it less worthwhile to the worker.

Monotony—Part Of The Job Or Of The Job Holder?

The problem of the proper balance between division and combination in job building is brought to a focus quite clearly in dealing with monotony and other associated causes of job dissatisfaction. In the past, it seems to have been the general opinion among scholars that monotony was not a characteristic of the job, but a characteristic of the job holder, and entirely a matter of his individual reaction to the job.[9] This seems to have been the assumption if not the conclusion of the Hawthorne experiment conducted by a group from Harvard University.[10] A later experiment, however, conducted by a group from Yale, seems to indicate a different conclusion.[11]

Monotony does inhere in the job itself, it now seems, especially for the normal worker who is assigned the usual routine job. The Yale group recommends, therefore, job enlargement, job rotation, individual pacing in some cases, or some method of giving greater variety and variability to the worker's activities. This view does not necessarily hold that the worker, taken as he is with his particular aptitudes and attitudes, has no responsibility in the matter, or that nothing can be done by training and constructive indoctrination to create job interest and enthusiasm. It does, however, indicate that in terms of economy of effort a modification of the job to fit the worker might be more productive than trying to modify or readapt the worker to fit the job. Specialization can be, therefore, self-defeating.

The second component of organization, as previously stated, consists of relationships—more specifically, the relationships between jobs and between the individuals and groups of persons assigned to their performance and supervision.

Relationships between the various activities in the work of the enterprise are made necessary by the integrated nature of the work itself. Many of these relationships, especially those between one elemental unit of work and another, are incorporated as parts of the individual job. In job building it is axiomatic that operations and processes should be divided no more than is necessary, that inter-work relationships should be made intra-job rather than inter-job. When relationships between activities that compose different phases or aspects of an operation can all be encompassed within the limits of a single job and made the complete responsibility of the person holding the job much of the problem of relationship is thereby eliminated. A single person being fully accountable for the performance of duty or body of work in its entirety should be able to coordinate all of its phases or parts, since it is his job exclusively. The real problem of relationship begins when an operation, process, or function cannot be effectively assigned to one job and person, but must be assigned to two or more, each dependent to some extent upon the other.

Forming Teams A Problem In Relationships

The problem of relationship in organization is, therefore, the problem of combining jobs, and their respective job holders, into groups that will constitute an effective team for performing the various operations, processes, and functions of the enterprise. In forming teams it is necessary to see that all essential activities are included, to prevent unnecessary duplication of effort or overlapping of authority, and to provide for effective control of activities and supervision of personnel. In this task the degree of difficulty of the problem of relationship increases directly, and often geometrically, in proportion to the degree of functionalization of activities and specialization of personnel. Where many dissimilar but interdependent activities must be coordinated, the problem of relationship seems at times to overshadow the actual performance of the individual activities. The limiting factor in a supervisor's span of control is, as has been recognized, the number of relationships supervised, not merely the number of jobs or persons.[12] A failure in relationships may thus easily nullify the advantages of properly constructed jobs, and limit the optimum degree of specialization and ultimately the size of the enterprise.

Supervision To Insure Coordination

Relationship in organization may be said to constitute, therefore, a main problem of supervision. Since all of the necessary work of the enterprise is, supposedly, divided up and assigned to a primary echelon of jobs and workers, what is left for the supervisory echelons is therefore only the problem of relationships. A task or problem that can be clearly separated from others and assigned to one person needs supervision only to the extent that the person to whom it is assigned lacks full competence. Supervision of individuals is in such instances mainly a matter of training, guidance, and motivation.

When two or more persons dependent on each other for proper performance are assigned to an integrated unit of activity, however, a supervisory authority is needed to insure coordination. Merely stating in the job manual that cooperation is one of the duties of the job, or of the person holding it, as is often done, is only the expression of a pious wish. And, leaving the matter of cooperation to be fought out and settled by the workers themselves is only an admission that the organizer has failed to complete his task.

The supervisor must give close and constant attention, therefore, to every contact and relationship of one job and worker to another. He must establish a system for the proper flow of work between each successive or simultaneous operation and interject his authority at every dividing line between jobs. He must in a manner also stand guard over all points of contact between his workers individually and collectively and between them and those of other units or departments of the organization. Attempting to supervise workers individually but failing to plan and supervise relationships between and among them

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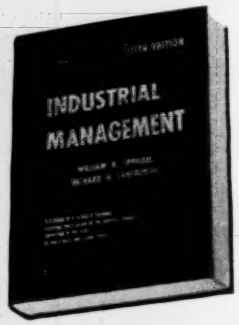

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is a weakness in organization and supervision too often overlooked, or recognized only as poor cooperation or poor leadership.

The problem of relationship is even more difficult and more acute when it concerns supervisors themselves and supervisors of supervisors. It is here that confusion in authority and responsibility as well as misfits in capability or personality do their greatest harm; even small mistakes in division of work or assignment of personnel may be magnified many fold by the time their effects reach the lower ranks. The effects of bad relationships in the lower ranks of workers *may be* corrected or at least ironed out by supervisors in the higher ranks, but bad relationships among higher supervisors, groups of workers, or major process or functions are seldom lessened as they spread downward through the lower ranks.

We Organize Both Jobs And People

Organization is thus a two-fold problem in at least two different ways. First, it consists of jobs and relationships. The jobs in this instance are units of work to be accomplished and the relationships are those between the jobs made necessary by the integrated nature of the process of manufacturing, or, the operation of the enterprise. The relationships grow out of the necessity of coordinating the various jobs with respect to such factors as the proper flow of work, the balancing of activities, the joint use of facilities, and the interdependence of certain operations. Such relationships are frequently referred to as work relationships or operational relationships.

Second, organization consists of persons and the relationships between persons. These relationships are dictated in part by the work or operational relationships between jobs and in part by the necessity for supervision, instruction, and advice, provisions for which are determined by management in its plan of functionalization and control and its type or plan of organization. Different relationships, for example, are created by territorial rather than centralized control and by a line rather than a line-staff organization. Such relationships are distinguished usually as the formal organization relationships.

It is possible to identify even a third category of relationships, those recognized generally as the informal organizational relationships. These are created mainly by the other two. The persons holding the various jobs develop relationships with persons in jobs that are neither related to their own by the necessities of the work process nor by those of the formal organization. A worker may prefer to get advice or instruction from the man at the next bench rather than from some designated staff expert, or to tell his troubles to a sympathetic fellow worker rather than to a professional in the personnel department. These relationships develop through time, proximity, and mutual interests and rely for their strength and permanence upon such factors as prejudice, temperament and personality. Although they may be often unexplainable and unpredictable, they may create situations that constitute problems for management to solve that are far more trying than those created by the other two.

Finally, organization seems to be essentially a two-fold process any way you look at it. It is the work to be done and the people who do it, the job and the man, the job and the other job, the man and the other man, the man and the boss, the man and the unknown man. It is division and combination, it is specialization and integration, and finally it is a matter of two-way communication and a semantics of organization. END

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What Communications Means To The Corporation President

An Original Research Report By

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Business executives have expressed varying points of view on the importance of communication in their companies, but the prevailing attitude of top executives as a group has not been clearly indicated. In an attempt to discover what that viewpoint is a questionnaire was designed by the Purdue University Industrial Communication Research Center to secure top executives' personal opinions toward communication rather than to get a picture of company communication practices. Here is a report of what the presidents of the one hundred largest corporations in the U. S. said in response to this questionnaire.

MANY businessmen have long recognized the importance of providing training for their employees, but the more informal processes of day-to-day communication such as interviewing and conference participation have been generally taken for granted. Today there appears to be a growing tendency to think of communication in a broad sense —to include not only the formal processes but also the informal processes — not only the language factors but also the non-language factors. When we use the term "communication" we refer to all of the processes through which information, attitudes, ideas or opinions are transmitted and received, providing a basis for common understanding and/or agreement.

How vital is effective communication in the operation of a modern business? Is there a relationship between good communication and employee productivity? What are the causes of communicative skills? These and other related questions were recently put to the presidents of America's largest corporations by the Industrial Communication Research staff of Purdue University.

The original questionnaire was pretested on five company presidents in the Lafayette area. After being modified to incorporate their suggestions, the questionnaire was mailed, with a cover letter explaining the project, to the presidents of the one hundred largest corporations in the United States. The list was prepared by the National City Bank of New York, based upon total sales or revenue. Every corporation on the list did a minimum daily business of one million dollars.

Fifty-one presidents completed and returned the questionnaire, and two other presidents wrote letters outlining their views on the subject. In addition, twenty other officials (vice presidents, directors of industrial relations, etc.) completed and returned the questionnaire on behalf of their respective presidents.

The attitudes of this select group are considered especially significant for several reasons: (1) These top executives represent the largest concentration of managerial talent and experience in the country. They have the responsibility of directing the production efforts of over one million employees. (2) Top executives have the perspective necessary to view the practical significance of communication in relation to other aspects of business operation. They are in excellent position to judge the importance of communication in the total organization. Specialized executives in Sales, Personnel, Industrial Relations, etc. are concerned with communication because of the nature of their jobs. The president, however, must have an overall viewpoint in order to coordinate the work of the management team. (3) The attitudes of these executives are important because they may affect their companies practices and policies, and also may exert an influence on the whole industrial field because of the magnitude of their company's activities.

Results: Eleven questions were directed to the company presidents in this survey. Here are the questions, a summary of the responses, and an analysis of these responses.

Which methods of communication are preferred if "very important policy" is to be transmitted?

The five alternatives listed below were submitted to the presidents who were asked to select the two methods "most likely to get the best results." Fifty-one presidents answered this question. The number of presidents who checked each item is indicated at the right.

What are the major causes of communications breakdowns?

1. Call a meeting of management personnel and explain orally.... 44
2. Hold personal interviews with key personnel 27
3. Announce policy in a management bulletin 16
4. Explain the policy in an interoffice memo 14
5. Explain the policy on the telephone or inter-com. 1

The responses show a decided preference for the use of oral methods in transmitting "very important" policies to managerial personnel. The data also indicate that when limited to two choices 21 executives preferred oral methods exclusively and none preferred written methods exclusively. The majority (30), however, favored a combination of oral and written methods. Since written media may be used in advance of the oral, simultaneously with the oral, or as follow-up (confirmation), it is possible that those who checked one oral and one written method saw an advantage in supplementing one method with the other.

The value of the joint method (oral and written) was expressed by E. J. Thomas, President of Goodyear Tire & Rubber Company, when he wrote:

> *Much communication must be done orally because in many cases speed of communication is a vital factor and messages can be communicated much more quickly orally than in writing. Wherever possible the oral communication should be supplemented, particularly in respect to major policy matters, by writing . . .*

Although the telephone or inter-com method ranked last, it should not be inferred that this indicates a lack of value of this method in more routine business. Apparently it is not a preferred method when "very important policy" is to be transmitted.

Is there a relationship between communication and employee productivity?

All of the executives who replied (50) believed that there was a relationship between communication (as defined in the questionnaire) and employee productivity. Ninety-six per cent of those checking this question said there was a "definite relationship" and four per cent saw it as a "slight relationship." While there seems to be little doubt that a relationship exists, it is apparent that further research will be required to establish the specific nature and degree of that relationship.

Is oral communication more important or less important than written communication?

Ninety-eight per cent of the presidents (47 answered this question) thought that oral communication was at least as important, and forty per cent thought it was even more important than written communication.

Since specific types of oral and written communication were not indicated, and since no reference was made to the importance of the content of a particular communication, the assumption is that responses reflect a value-judgment of overall relative importance.

Is there a relationship between breakdowns in communication and labor disputes?

Ninety-four per cent of those replying (49) were of the opinion that there was a relationship between breakdowns of communication and labor disputes and strikes. Seventy-nine per cent thought there was a "definite" relationship, while fourteen per cent believed the relationship to be "slight." Only six per cent believed there was "no relationship."

What are the major causes of communication breakdowns?

Ten common causes of breakdowns in business and industrial communication (listed below) were submitted. Each president was asked to check only those factors that he considered to be *major* causes. The number of presidents who checked each item is indicated at the right.

1. Inadequate use of communication media 34
2. Lack of communicative ability in management personnel 32
3. Inadequate training program 23
4. Management withholds information from subordinates 19
5. Little opportunity for communication "up" 16
6. Lack of communicative ability in foremen 15
7. Union "meddling" agitates employees 10
8. Confusion of authority 8
9. Clashing personalities 3
10. Communicators not well liked by subordinates 0

If a satisfactory solution to a problem of communication breakdowns is to be found, the real causes of the problem must be located. It seems reasonable to assume that although these causes may vary from company to company, depending upon the situation, it should be possible to discover the more common and the more basic causes of communication breakdowns.

In answering this question the executives have indicated what they *consider* to be the major causes. Whether these are the real causes or not could only be determined by careful analyses of specific situations. However, the responses seem to indicate a belief that (1) certain factors are more likely to be significant causes than others, and (2) there are many causes of communication breakdowns rather than any single cause.

The rank order of these factors might be helpful in starting a search for sources of communication impairment or ineffectiveness.

What is the nature of communicative ability?

This question was included in the survey in order to ascertain the viewpoint of executives regarding the *communicator* in the communication process. Earlier in this report reference was made to the fact that some people take communication skill for granted. Whether justified or not it appears that such an attitude might be explained on one of the following bases:

(1) Many have not considered communicative ability as a special or important *skill*. The assumption seems to be that if a man has the required amount of technical knowledge—or other *technical* skills—he has all that is required, or (2) it may have been assumed that all managers can communicate, or (3) it may have been recognized that communicative ability is a skill that managers should possess but it has been assumed that a manager either has it or

has not, and whatever this ability, it is not subject to improvement through training.

Considering the foregoing analysis, the reactions of these company presidents seem to be particularly striking. Given a list of seven alternatives the presidents were asked to check all statements that they believed to be true. Fifty-one presidents answered this question, and the number who checked each statement is indicated at the right.

1. Communicative ability is a combination of natural talent and skill that may be developed by training and experience	46
2. Is a skill that can be learned	35
3. Can never be developed by some people because of personality traits	15
4. Is best developed by years of experience on the job	13
5. Is an ability that nearly all top managers possess	12
6. Is primarily a natural gift or talent	5
7. Is closely related to the amount of formal education a person has had	0

It is apparent that as far as these presidents are concerned they believe that the following statements are true:

(1) *Not all managers can communicate* effectively (only 12 out of 51 thought that nearly all top managers possess this ability).

(2) While natural talent is a factor in communicative ability, it is not the only factor.

(3) Greater communicative ability can be developed through training and experience.

Should training in methods of communication be provided for management personnel?

One hundred per cent of the presidents responding (49) believed that communication training of some type should be provided for management personnel. The Purdue Industrial Communication Research Staff is presently conducting a study of the communication training programs now being provided by business and industrial firms for their own personnel. The results of the survey seem to indicate that many of the major companies are already doing what this group of corporation presidents believe should be done.

At what levels should communication training be provided for management personnel?

49 presidents answered this question as follows:

Top management	33	(67%)
Middle management	44	(90%)
First line supervisors (foremen)	45	(92%)

The responses to this question indicate a belief that communication training should be provided for all levels of management. Bearing in mind the fact that this question was answered by top-management, it may be significant that 67% of this group thought that top-management should also receive this training. Moreover, these results are consistent with the replies to Question No. 6 in which only 24% of the presidents believed that "nearly all top managers possess" communicative ability.

How much does the authority of a communicator's position affect the reception of his ideas?

One hundred per cent of the executives surveyed thought that the authority of the communicator's position had some effect on the reception of a person's ideas. Seventy per cent of the group (37) thought that the authority of the communicator's position very much affected the reception of his ideas.

SAM National Meetings — 1955

April 30, 1955	Board of Directors
May 28, 1955	Executive Committee
June 25, 1955	Board of Directors

How much does the personal regard listeners have for a communicator affect the reception of his ideas?

Nearly ninety-eight per cent of the executives believed that the personal regard the listeners have for the communicator is of some importance. Seventy-three per cent of the group thought that this factor was very important.

The replies to questions number 9 and number 10 seem to high-light the importance of the non-language factors in the communication process. This has been succinctly pointed out by an executive of Deere & Company, when he said:

Every action, every established condition, every practice, every non-language treatment of individuals and groups, etc. within a business concern conveys something . . . everyone radiates attitudes, personal concerns, and personal qualities of varying kinds. These elements are more intangible but just as real and just as resultful as oral or written language.

To what extent is the effectiveness of management personnel dependent upon ability in oral communication?

The vast majority of the respondents indicated that effectiveness of management personnel is greatly dependent upon ability in oral communication. Many executives affirmed their belief that oral communication is more important than written communication in the performance of certain managerial tasks. Representative comments were as follows:

Edward Foss Wilson, Chairman of the Board, Wilson & Co., Inc.:

In transmitting information to hourly plant employees through the first line supervisors, oral communication is extremely important. No matter how effective written communications may be, much of the information about the Company and its policies must be transmitted through oral communication from a supervisor to his employees.

F. R. Kappel, President, Western Electric Company, Inc.:

There needs to be written statements of basic management policy to insure effective management, but actual operating results are usually the product of oral instructions. The day-to-day job depends upon effective oral communication.

William White, Former President, New York Central Railroad:

Effectiveness of management personnel of all grades is very dependent upon the ability to communicate orally not only the policy of the company but suggestions as to how work should be done, criticism of poor work, and the application of discipline, and of course in the general field of human relationship. In oral communication the impact of management personnel's personality can be transmitted very much more effectively than by written communication. Furthermore, oral communication offers means for communication "up."

Frank M. Folsom, President, Radio Corporation of America:

The effectiveness of management personnel is very highly dependent upon their ability in oral communica-

tion. Communication also takes place through verbal emphasis and suggestions which are loaded with meaning. Management personnel have frequently been able to influence or convince people regarding situations or matters where written media would not have produced satisfactory understanding and acceptance.

The relationship between effective oral communication and managerial ability was stressed in the following statements:

Paul Endacott, President, Phillips Petroleum Company:

A great amount of information comes to the management of our company in the form of oral communication, and we find that this saves time and also promotes a clearer understanding of the subject matter.
T. S. Peterson, President, Standard Oil Company of California:

Effectiveness in oral communication in my opinion is an essential in management personnel.

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Harry E. Humphreys, Jr., President, United States Rubber Company:

There is no question in my mind as to the importance of communications ability for the modern executive. He must have the ability to think clearly and express his ideas clearly by either verbal or written means. Oral communications is, of course, the most direct and convincing method of getting ideas across.

Views of The Non-Presidents: Twenty non-presidents also completed and returned the questionnaire. Included in this group were vice presidents, directors of industrial relations, executive assistants to the presidents, general managers, etc.

Inspection of the results indicate that the views of the non-presidents are in almost complete agreement with those of the presidents.

In their answers to Question No. 11 (To what extent is the effectiveness of management personnel dependent upon ability in oral communication?) the group took about the same position as the presidents. Typical of their reactions are the following comments:

E. F. DuPont, Director of Employee Relations, E. I. DuPont de Nemours & Company:

The effectiveness of management in oral communication depends to a considerable extent upon the ability of the management representatives. This ability, however, is not something necessarily native to the person's own qualifications; he can be trained to do a more effective job by the proper methods. It is my opinion that by far the greater number of effective management efforts in the field of oral communication have been obtained by training than by native ability per se.
William D. Merrifield, Director of the Department of Industrial Education, Chrysler Corporation:

Effective Communication Cited As Basic To Managerial Ability

The effectiveness of management personnel depends a great deal upon ability in oral communication. Such ability plays an important role in the selection of management people for new and better opportunities.

J. W. Keener, Vice President, B. F. Goodrich Company:

To a major degree, managers can be effective only as they act through others, a result that cannot be attained without some form of communication.

R. H. Biron, Vice President-Administration, Consolidated Vultee Aircraft Corporation:

Ideas are worthless unless they can be communicated intelligently to others.

Edward C. Meyers, Assistant Vice President, Industrial Relations, United States Steel Corporation:

Oral communications ability is one of the significant factors influencing the effectiveness of management personnel.

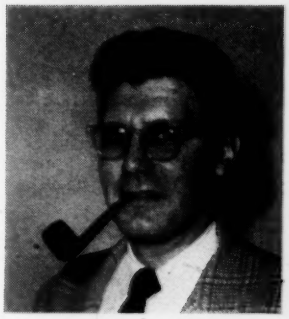
A Ten-Point Summary Of Top Executive View of Communications

Conclusions: The purpose of this survey was to discover the viewpoints of the top executives of business and industry concerning the nature and importance of communication. An analysis of the results obtained seems to warrant the following conclusions which reflect the consensus of this select group.

1. Very important policies should be transmitted orally or in combination with written media.
2. There is a definite relationship between communication and productivity.
3. Oral communication is at least as important as written communication, and may be even more important.
4. There is a definite relationship between breakdowns of communication and labor disputes and strikes.
5. "Lack of communicative ability in management," "Inadequate use of communication media," and "Inadequate training programs in the field of communication," appear to be major causes of breakdowns in industrial communication.
6. Communicative ability is a combination of natural talent and skill that may be developed by training and experience.
7. All levels of management should receive training in methods of communication.
8. Effectiveness in communication is partially determined by the authority of the communicator's position.
9. The personal regard that listeners have for the communicator seems to effect the reception and acceptance of his ideas.
10. Ability in oral communication is an important factor in managerial effectiveness.

END

RUSSELL L. ACKOFF has been a consultant to the Philadelphia City Planning Commission, the Task Force on Ultimate Consumer Goods, ASTM; Naval Ordnance Test Station, and the U. S. Bureau of Census. He was a Research Associate on the Project Doan Brook (OR Section), Assistant Professor in Mathematics and Philosophy at Wayne University and an Instructor in Philosophy of Science at the University of Pennsylvania. He has written extensively on Operations Research and Philosophy.



Production Scheduling: An Operations Research Case Study

Dr. Russell L. Ackoff
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Cleveland, Ohio

What lot size results in lowest production costs? This problem of economic lot size, traditionally, has been attacked by balancing production set-up costs against inventory carrying costs. This unusual case study describes how an operations research team at Warner and Swasey Company approached this problem with new skills and thoroughness, found economic lot sizes and solved the related problems of production scheduling, storage and forecasting annual sales.

THE case study I am going to present is primarily directed toward emphasizing two aspects of Operations Research. The first aspect is the *breadth* of the OR approach to problems, its attempt to consider the effect of a policy decision on all phases of an organization's operations; in other words, the inclusion of the widest possible range of variables. The second aspect involves the concept of *continuous* or *dynamic* research: that is, the continuous extension of the scope of the research as it proceeds, generating new problems with the tentative solution of each previous one. Thus, problems are never *solved* in any absolute sense; the research is designed to enable the organization to proceed from one level of operating efficiency to a higher level in successive and progressive steps.

This particular case began in June 1952, when the Operations Research Group at Case Institute was invited by the President of the Warner and Swasey Company to speak with him and several other executives.

First let me tell you a little bit about the Warner-Swasey company. It is the world's largest producer of turret lathes, turning out better than 50 percent of the total of this country's output. The company also produces several other lines, some related and others unrelated to its major product. Turret lathes vary in price from $10,000 to $40,000. In 1952-53 the company did a total business in the neighborhood of $55,000,000. Early in 1954 employment in its plants was about 3500. Employment was higher during the war, but even now the plants are operating with several shifts.

The executives of the company had no one particular problem in mind. We suggested that before selection of a problem was made we should know much more than we did (we knew practically nothing) about the company's operations. Consequently, we suggested that a few weeks be devoted to orientation by our group—that we spend this time getting familiar with the company and formulating posssible OR problems. This suggestion was accepted by the executives with no hesitation.

A team of three was established. It included two from Case Institute's OR Group and one member of the company. I would like to say categorically that any success the group may have had is due primarily to the contribution of the company member and the cooperation of company personnel at every level of its operations. The company member of the OR team was experienced in corporate financial research. He is a sort of trouble-shooter on the staff of the company's treasurer, and as such has dealt with a variety of messy problems involving every phase of the company's operations. Though he had had no previous contact with OR, his wide experience and preoccupation with *methods* of problem-solving made him an ideal member of the team.

We were given space in the treasurer's office though we continued to report directly to the president of the company. The treasurer, however, greased many skids for us. The team has varied in size. It has included as many as four professionals from Case, graduate student assistants, and varying numbers from the company. Throughout, consultation has been frequent with all other members of the Case OR group, other members of the faculty, and a wide variety of personnel from the company.

The initial job of at least the Case members of the team was one of orientation. First a comprehensive tour of the main plant and administrative offices

was arranged. Then we asked to see organization charts. The company is not "chart-happy" and consequently there was some difficulty in obtaining a chart. Once it was obtained, our questions soon demonstrated how unrevealing such a chart can be regarding operations. Consequently, we asked ourselves what it was we wanted to know about the company. We wanted to know (1) the *nature of the operations* in which they are involved. and (2) how they *control* these operations.

Now, as soon as we started to toss around the term "control," the approach of cybernetics—the science of control through communication—came to mind. In effect we decided to consider the organization as a communications circuit which controls a productive process. Where, then, is the ultimate source of information that flows through the circuit? It is the customer, the user of the product. How is information transmitted from customer to company? Through sales engineers.

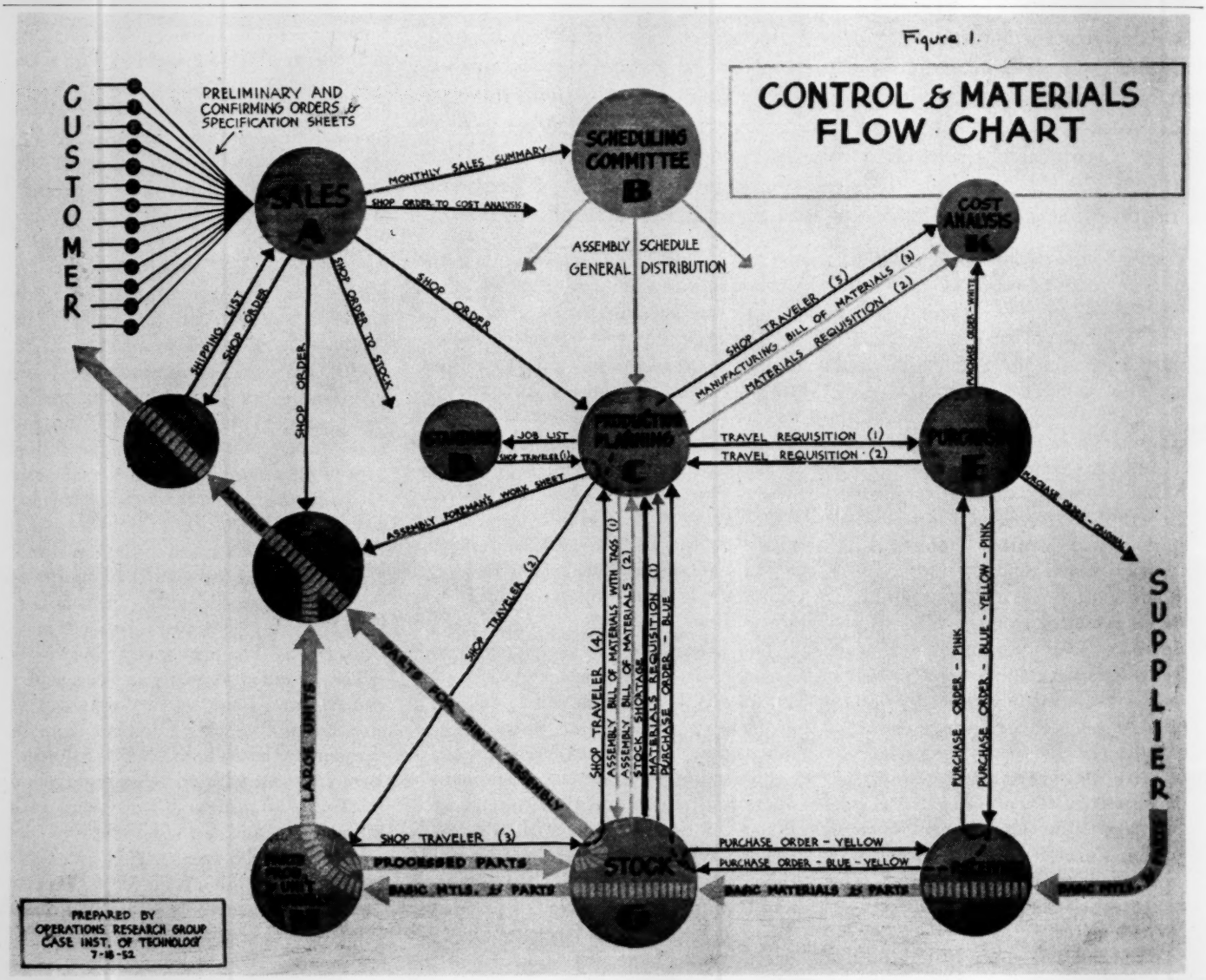
We began our orientation, then, in the sales department. We learned how salesmen selected potential customers, what type of contact they made with customers, how they reported their activities, how orders were prepared and so on. Then we examined the processing of this information through the various sections of the sales department, and learned how the processed information was put into the production system. We saw how the information eventually came to pick up raw material, transform it, and eventually yield a product that was shipped to the customer.

At the end of two weeks we had reams of data and forms. This had to be digested. We spent several days extracting the essence of this complex process and recording it in a "Control and Materials Flow Chart." (See Figure #1)

It would take too long to explain this chart in detail, but I should like to explain one part of the circuit illustratively. The production planning department receives an assembly schedule each month. This schedule shows the numbers and types of units to be shipped for the next five months. For each type of unit scheduled, the production planning department has a complete list of required parts. Further, for each part this department has a file card which shows how many are in stock, in production, or on order from vendors. For any one part there are four possible situations which can exist: (1) it is produced by the company and is in stock, (2) it is produced by the company and is not in stock, (3) it is purchased and is in stock, and (4) it is purchased and is not in stock. Let us only consider here what happens in the fourth case.

Production Planning prepares a list of all the out-of-stock purchased parts for a given model of turret lathe. This list is called a "Traveling Requisition" and is sent by the Production Planning Department to the Purchasing Department. The Purchasing Department prepares seven copies of orders for each part and returns the Traveling Requi-

Figure 1.



sition to the Production Planning Department as a notice that the orders have been placed. The original copy of the order goes to the supplier. One copy goes to the Cost Analysis Department which eventually uses this information with other information to determine unit production costs. Three copies are sent to the Receiving Department. The remaining two copies are placed in a moving file in the Purchasing Department to enable them to keep their fingers on delayed deliveries and follow them up.

When the Receiving Department gets the ordered parts from the supplier, it returns one copy of the order to the Purchasing Department. The Purchasing Department puts the order into an inactive file. Its job is completed. The Receiving Department sends the parts along with its two remaining copies of the order to the Stock Room. Stock Room personnel receipt one copy and return it to Receiving, whose job is now completed and recorded. When the parts are entered in stock the last copy of the order is sent by the Stock Room to the Production Planning Department. This department notes the availability of the part on that part's stock card. This circuit is now complete.

The circuits for each of the other parts-possibilities are also shown on the chart, along with other phases of the process. Not only did we find this chart useful, but the company's executives have found it fruitful in discussions of organization, and for orienting new employees and visitors. Consequently, several large copies were made and are in use by the company.

Problem Of Inventory Levels Affects All Departments

In the process of collecting the information necessary for preparing the analysis the chart represents, the team began to get a "feel" of a problem that concerned just about every department. This was not surprising since the problem involved inventory levels.

As might be expected in connection with a product that ordinarily has a highly variable demand pattern there was considerable concern with the risks involved in carrying a large inventory. In a period when high volume requires a high level of inventory, concern with the costs of carrying too low an inventory is shoved into the background and active planning is concentrated on the first aspect of the problem.

The team obtained records of the physical inventory taken at the end of 1951 and analyzed them by product and inventory class. The analysis made certain obvious things more obvious; for example, that 65 percent of the inventory was devoted to turret lathes. The study also disclosed a not-so-obvious fact: 29 percent of the inventory was invested in parts in process and finished parts for turret lathes. On the basis of these facts, and the fact that an inventory problem seemed to be a good way to get into company operations, we decided to recommend a study of the turret-lathe-parts inventory.

Inventory Level Affects Production Costs Not Sales Volume

We met again with the company's executives, showed and discussed the Control and Materials Flow Chart, and suggested the parts-inventory problem. They agreed with the suggestion and we were "turned loose."

We probed to find out what people in the company took the parts-inventory problem to be. The then current formulation was: What is the minimum parts-inventory necessary to maintain our present level of shipments?

The OR team suspected this formulation of the problem because it assumes that the margin of profit on sales is constant or, at any rate, if it varies, its variations do not depend closely on the inventory level. If, as we suspected, the size of the inventory can be used to reduce production costs with direct results on operating profits, it seems that the size of inventory should be determined not as the least amount necessary to support a given volume of sales, but as the amount which can be used to yield the greatest profit at the given sales volume. Such reasoning led us to reformulate the problem as one of developing a method of scheduling the production of parts in such a way as to yield greatest profits.

What is involved in the production of a part? Here our orientation showed its worth. First there are the raw materials whose values are composed of purchase price plus freight costs. Then there is a raw material inventory stage in which more money is invested in the materials. Then there is a planning stage in which the future of the material is determined. This planning also involves a cost. The shop must be set up for producing the part. The material must be worked on, and it must wait between operations. Then there is a finished parts inventory.

On the basis of a preliminary study we decided that raw material and in-process inventory would be little affected by changes in the production system. To simplify the problem, we assumed this to be so. Subsequently we came back to these assumptions. But more on this later.

This loose description of the production of a part had to be tightened. Such tightening was brought about by studying the current scheduling of parts and by identifying and defining the pertinent variables in the process. The parts were scheduled monthly in this company (i.e., a one-month scheduling period). It was convenient to have some time interval relative to which costs were computed. The period of one-year was selected and was referred to as the *planning period*. The model developed is general in the sense that the scheduling and planning periods can be set at any specified interval.

The following variables were identified:

C_1=set-up and take-down cost per lot.

C_2=raw material cost plus process cost per part.

SAM A Research Publication

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by G. Jay Anyon, Ph. D.

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P =inventory carrying cost expressed as a per cent per month of the value of the part.
L =required number of parts per scheduling period.
m =number of scheduling periods.
N =mL=number of parts required per planning period.
N'=mL/n=number of parts per lot.
K =total incremental production cost per planning period (i.e., total cost less raw material inventory cost and in-process inventory cost.)
K'=total incremental production cost per lot.
n =the number of lots per planning period.

The meaning of at least some of these variables is far from obvious, so let us consider them one at a time.

A Definition Of Variables That Make Up The Problem

First let us consider C_1, the set-up and take-down cost per lot. The term "lot" refers to all the parts which are made for a single set-up of the machines. The size of a lot may vary. In other words, it is the number of parts scheduled for a given set of operations. The set-up and take down cost includes a number of components, four major ones: (1) Office set-up: before anything is done in the shop, the Production Planning Department must schedule that production and the standards Department must prepare necessary drawings and control forms. This preparation costs money. It took some study to isolate and measure this cost, which is independent of the number of parts scheduled, because it is a paper operation. (2) Shop set-up cost: this consists of the cost of actually adjusting the machines to perform the needed operations, the cost of the scrap which is involved in making adjustments at the beginning of the run, and the cost of setting up the quality inspection procedure. (3) Shop take-down costs: this involves the cost of entering the finished parts into stock and performing the necessary paper work attached thereto. (4) Office take-down: this is the cost of the analysis performed by the cost analysis section, a process which involves the use of I. B. M. equipment.

It is apparent that the job of estimating the value of the variable, C_1, for any specific part is not simple. It required a good deal of work with a number of departments. This work had a good effect, however, for it raised an important question. The cost accounting system did not lend itself easily to providing values of this variable. Shouldn't it be equipped to do so? The company's new comptroller used this question to reinforce his effort to convert the accounting process from one which in the main presented passive historical statistics to one which provided active control-data. The need for functional accounting was supported by our efforts. Subsequently we were able to assist in the conversion in a small way.

The second cost listed, C_2, is also a combination of two costs which are ordinarily treated separately. It became convenient at this point of our study to group them. The first component is the cost of the raw material used in making the part. The second is the process cost; that is, the cost of direct labor expended in working on the material, plus overhead. Overhead costs, which are included in C_1 as well as C_2, were not easy to determine. A satisfactory preliminary estimate was obtained which expressed this cost as a function of man-hours of direct labor involved in the operation.

The third cost is that of carrying goods in inventory. We went through the literature in an attempt to find a way to estimate this cost and we consulted with an expert accountant. But all this effort was in vain. We were forced into doing the job for ourselves. It was done as follows:

Determining Cost Of Carrying Goods In Inventory

A study was made of the cost involved in running one of the company's warehouses. We took account of rent, heat and light, alarm service, wages, supervision, supplies, and depreciation. The ratio of the sum of these costs per month to the value of the parts stored was 0.88 per cent. To this was added the cost of borrowing the capital invested in the inventory. This yielded a figure slightly more than 1 per cent per month per dollar invested in stock. For safety's sake in subsequent analysis a pessimistic figure of 2 per cent and an optimistic figure of 0.5 per cent were also used. The effect of so doing will be considered later.

The next variable in the list, L, is the required number of parts per scheduling period. In this company the scheduling period is one month; that is, a new assembly schedule is issued each month. Therefore, withdrawal of parts from stock for assembly occurs once a month. That is, withdrawals for assembly are discontinuous and occur once each month.

Since the company is working against a backlog of orders, the monthly requirements will remain relatively fixed until that backlog has disappeared. This simplifies the initial problem, but subsequently (as later discussion will show) the handling of variable demand was taken into account.

Find The Number Of Lots That Minimizes Production Costs

The next variable, m, represents the number of scheduling periods per planning period. We took one year to be a planning period. It turns out, however, that the scheduling procedure eventually derived is independent of this variable.

The remaining variables are more or less self-explanatory. N, the number of parts required per planning period is equal to the product of the number of scheduling periods per planning period and the requirement per scheduling period; that is mL. N', the number of parts per lot is equal to the requirements per planning period (mL) divided by the number of lots per planning period (n); therefore, $N' = mL/n$. The total production cost per planning period and per lot (K and K′) need no explanation.

The variable n, the number of lots per planning period, is critical because it is the "manipulation" variable; that is, it is the aspect of the system which can be set so as to yield varying costs. The problem is to find the value of n for which the total annual production cost is minimum.

Once the variables are identified the problem is to relate them. We can begin by considering the total cost per lot. This cost can be broken down into the sum of four components:

(1) Set-up and take-down cost per lot.
(2) Raw material and process cost per lot.
(3) Inventory cost on the investment in set-up and take-down cost per lot.
(4) Inventory cost on the investment in raw material and process cost per lot.

Each of these components can be

translated into the symbols we have introduced. The details of the translation need not concern us here. The result, however, is the following equation:

$$K = nc_1 - mLc_2n - \frac{nPc_1}{2}\left(\frac{m}{n} - 1\right) - \frac{Pc_2Lm}{2}\left(\frac{m}{n} - 1\right).$$

K is the total incremental production cost per planning period.

Now, for any part of the values of c_1 (set-up—take-down costs), c_2 (raw material plus process costs), P (inventory rate), L (monthly parts requirement), and m (number of scheduling periods per planning period) can be determined. The problem is to find the optimum value of n, the number of equally sized lots to be run per year, when the above quantities are known. This can be determined graphically. That is, the total annual cost for a number of values of n could be computed and plotted on a graph. The results would look like the curve shown in Figure ♯2.

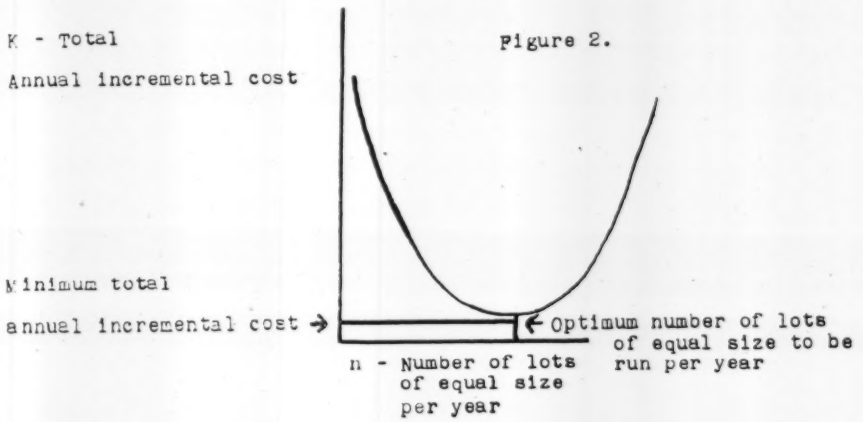

Figure 2.

FIGURE 2.

The optimum value of n (n_o) is one for which the total annual cost is minimum. The graphic solution does not give the exact value of n required: the methods of differential calculus enables us to derive an equation which yields the exact optimum value of n. We need not be concerned with the mathematics here as long as we realize that we are simply finding the value of n that minimizes the value of K. The resulting equation for n_o is as follows:

$$n_o = m\sqrt{\frac{LPc_2}{c_1(2-P)}} \quad (2)$$

The value of n_o given in the equation above is the most economic number of equally sized lots to be run per year. To obtain the optimum lot size, N'_o, an algebraic translation yields the following equation:

$$N'_o = L/\sqrt{\frac{LPc_2}{c_1(2-P)}}$$

Note that the optimum lot size is independent of M, the number of scheduling periods per planning period, and hence is independent of the length of the planning period.

Equation (1) for total incremental cost per planning period has a limitation on its usefulness: it is exact only if an integral number of months' requirements are made per lot run. If, for example, 1½ months' requirements are included in a lot, this equation only gives an approximate value of the total incremental cost. Furthermore, it is not practical to schedule non-integral multiples of monthly requirements per lot. This practical difficulty can be shown in this way. See figure ♯3.

If, for example, 1½ monthly requirements are made, 1 month's requirement is withdrawn almost at once, leaving ½ month's requirement in inventory for a month. But at the end of the month another month's requirement is needed, and only ½ is available. This suggests the modification in scheduling shown in Figure ♯4.

That is, by scheduling 1½ monthly requirements for two consecutive months, and skipping a month, the difficulty which arises from the procedure shown in Figure ♯3 is overcome. But it becomes apparent that the ½ monthly requirement inventory carried the first, fourth, etc., months can be eliminated if the procedure shown in Figure ♯5 is used.

The procedure shown in Figure ♯4 is the most practical. It can be generalized, and suitable modifications in equation (1) and (2) can be made.

The first three terms of the resultant revised equation (1) are the same as these shown in equation (1). Total set-up costs, material and cycle costs, and inventory on set-ups remain unchanged. But inventory on material and cycle costs are increased. This increase, for the problem at hand, turned out to be negligible, consequently we could use equation (1) to compute costs, since it is simpler to use; but we could schedule in integral lots according to the procedure just described.

The economic lot size equations considered above represent no unique contribution of OR. Industrial Engineers have been using such equations since about 1920. What is unique to the OR approach is yet to be presented; it is what comes after the derivation of these equations. More explicitly, it is the generalization of the approach to handle variable demand and to include costs associated with numerous other phases of the company's operations.

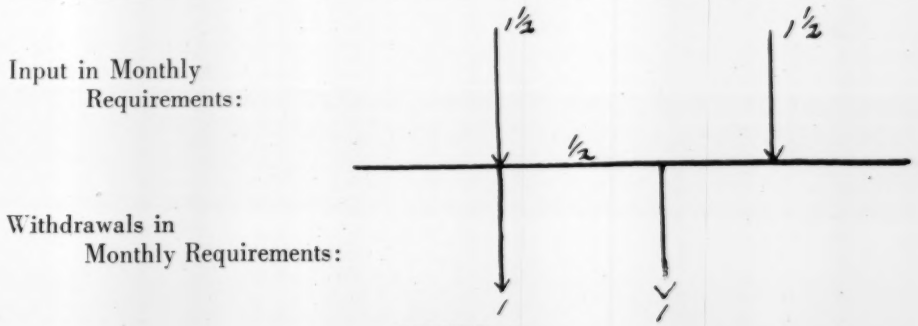

FIGURE 3.

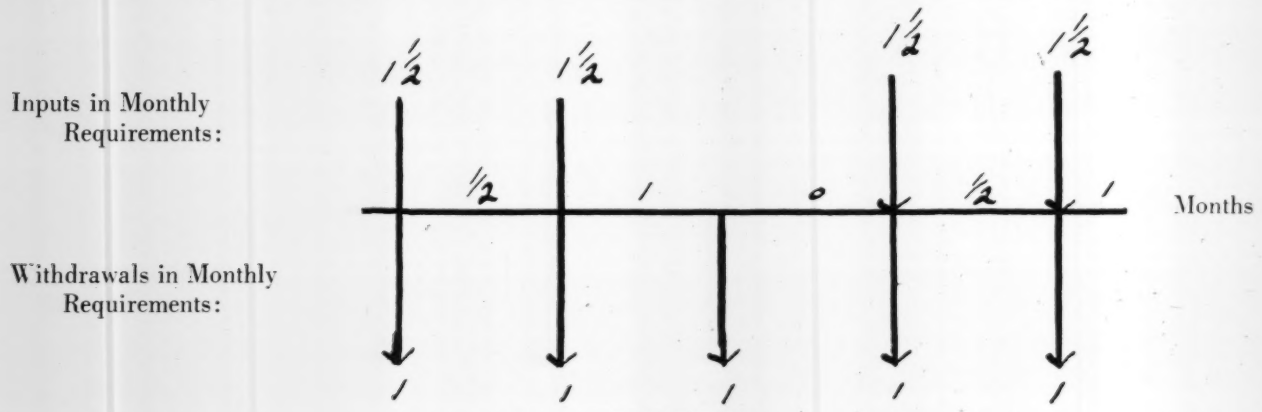

FIGURE 4.

When these optimum economic lot size equations had been completed, the OR team met once again with the executives of the company. The mathematics was not discussed but the underlying ideas were. The meeting brought out a good deal with respect to the definition of costs, and ways of obtaining estimates of the various costs. The executives decided that it would be worth trying out the equations. The Production Planning Department agreed to select twenty-three parts for this purpose. No systematic sampling went into their selection; rather, the parts were selected because they presented a wide variety of scheduling problems.

After the parts were selected, the team computed the total annual cost of, and set-up time for producing each, using then current scheduling practices, and also computed total annual cost and set-up time assuming production in most economic lot sizes. The results indicated a large potential saving in both costs and time. To obtain these savings, it was indicated that inventory practically had to be doubled. That is, by increasing the finished parts inventory to about twice its then current size, substantial savings in time and money were indicated.

Another meeting with the executives brought agreement that the results obtained were of such a nature as to merit further study. We decided to study intensively a sub-assembly unit consisting of 112 parts, and make a comparison similar to the one made for the 23 parts. In this study a comparison was first made between scheduling one month's requirements per month and the optimum procedure. The results indicated a reduction in production costs of approximately 10 per cent, and a reduction in set-up time of approximately 85 per cent. Of this potential reduction of 10 per cent in production costs, then current scheduling procedures were obtained 6.5 per cent, leaving a further potential reduction of 3.5 per cent.

The Scheduling Department had been using a lot of the size required for one month as "normal" and departing from this normal wherever it appeared economics in purchasing or processing would result from larger lots. This meant they were bucking the psychological hazard of deciding to increase inventory when they scheduled larger lots. The economic lot calculations were closer to their actual pattern of scheduling than the "normal" they were used to. Since the economic lot standard was higher than actual practice it put them in the psychological position of keeping down the company's money "tied up in inventory." In effect, use of the economic lot as a standard made it necessary to justify reductions of inventory from the new standard rather than increases from the old one.

Management considered the results of this comparison significant enough to warrant institution of an experimental program for conversion of production to optimum lot sizes.

To some this might seem like the end of the role of Operations Research. But in fact it was in a very real sense "only the beginning." The most difficult and characteristically OR aspects of the problem arose once implementation was accepted as something to be desired. All the succeeding problems cannot possibly be covered in detail, but their nature can be indicated, and in some cases how they were or are being handled.

First, we assumed in the development of the parts production model that the in-process inventory was not significantly affected by changes in production scheduling. This assumption had to be examined. An equation expressing the cost of carrying in-process inventory was developed. By the use of this equa-

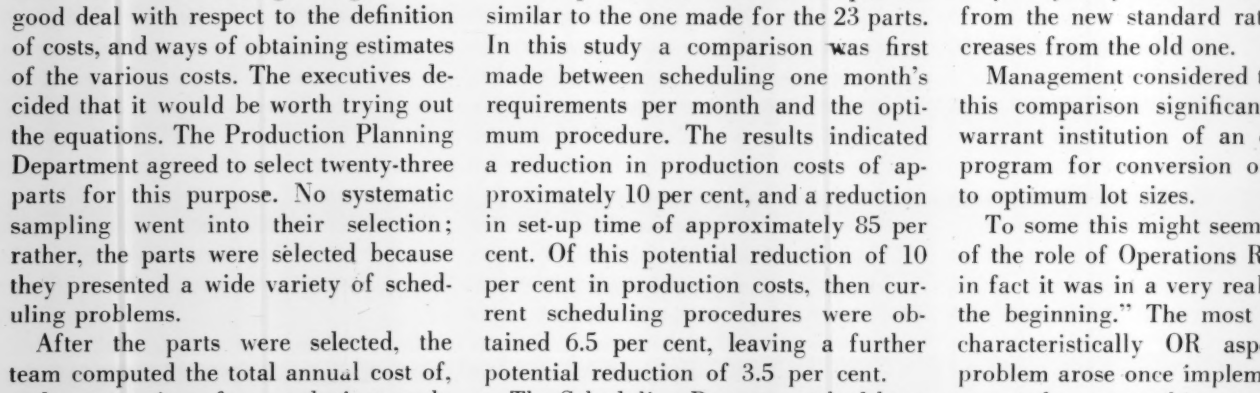

FIGURE 5.

tion, we determined the increase in in-process inventory cost produced by optimum scheduling compared to current practices. It turned out to be negligible, thereby justifying the initial assumption.

Secondly, an increase in inventory brought about by moving towards more economic lot sizes requires additional capital. This raises three questions: (a) How much money is needed? (b) At what interest rate can it be obtained? (c) How would this increase in borrowed capital affect the credit and financial standing of the company? A study was conducted to answer these questions.

Optimum Scheduling Causes Production Bottleneck

Next, we assumed that the cost of raw material would not be affected by changing the production schedule of parts. The results obtained indicated the possibility of ordering raw materials in larger quantities and benefiting thereby from cost reductions. Investigation showed this would only be true for a small percentage of the parts. But we learned, in this inquiry, that freight costs could be significantly reduced on certain parts. Trucks are used to haul some parts. For example, the cost for hauling forty parts in some cases is virtually the same as for hauling ten parts. It was not considered practical to take resulting changes in freight costs into account in calculating economic lot sizes, it was considered that this was one more benefit to be expected as economic-lot-size production is approached.

A whole group of problems involving the mechanics of scheduling arose. For example, we found out that one part should be scheduled so that eight months requirements should be produced at a time. This part requires almost all of the work done on it to be done in one shop section. If eight month's requirements were put through this section at a time, no other parts requiring work by this section could be processed for about a month. This situation represents what the Operations Researcher calls a queueing or waiting line problem. Unfortunately, in this case, the situation was much too complex to apply available techniques for handling such problems. To get an idea of the complexity of this in-process waiting line problem we constructed on paper a small model company, one very similar except in size to the company involved. We scheduled through several years to make a conversion to optimum scheduling. Though only four parts were involved in this paper operation, this dry run enabled us to anticipate most scheduling problems involved in conversion in the Warner and Swasey Company. This experience provided an insight into some of the factors which in practice would require less than economic lot size scheduling.

I shall mention only briefly some of the practical scheduling problems. Though optimum scheduling, when in operation, would require less than current production hours for the same output, it requires more to get over the "conversion hump" because larger runs for some parts must be started while others continue to be produced by the current procedure. The conversion can be accomplished gradually by using what "play" is available in the current scheduling, or by capital expansion, or by sub-contracting parts until the hump is mounted.

Economic lot size computations were very valuable in this study because it provided a basis for computing the reductions in production cost that increased facilities would yield. This reduction was compared with cost of the new facilities.

The policy of gradual conversion was selected. It was estimated that three years would be required to complete the conversion by this method. Possible effects of increasing and decreasing volume of business on conversion were studied and plans for meeting such contingencies were developed.

Changing Order Of Processing Repairs Gives More Space

A study of the storage facilities available for the parts in this model is necessary to determine for which parts additional storage space is required, and how much. It also provides a basis for determining which parts can now be produced in larger runs without creating a storage problem. Concern with additional storage space turned our attention to the process of filling orders for repair parts. A team set up to study this problem found that by modifying this repair order processing, storage space currently used in that process could gradually be made available for storage of finished parts. This study also showed how to alleviate shortage problems arising out of borrowing parts for assembly to fill repair orders.

The clerks who do the actual scheduling are not equipped to handle mathematical formulae. Consequently, at first graphic devices (nomographs) were developed which would permit them to determine optimum run sizes very simply. But even with a nomograph, the clerk needs basic cost and requirement figures. Arrangement with the Cost Analysis and Sales Departments are necessary to get current data. Arrangements for recording the data in a convenient way are also necessary. The company is in the process of converting to the use of automatic equipment for scheduling. Studies have indicated that the mathematics involved in optimum scheduling can be handled accurately, quickly, and economically on this equipment. The nomograph is still useful, however, for checking purposes and for handling certain problem-parts.

In arranging for the supply of required cost data it became increasingly apparent that costs are subject to variation due to short range changes in the production process and to the accounting interpretation of these changes.

The extent of such variation had to be determined along with its possible effect on the new scheduling procedure. A study of this variation was made. It showed that within the range of costs to be expected it was still profitable to schedule in the way described. For example, it was shown that inventory cost

CHAPTER MEMBERSHIP STANDINGS

February 1, 1955

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Detroit	207	Hartford	56
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(P) would have to be greater than 3 per cent per month, on the average, for then current procedures to be better than those described here as optimum. It will be recalled that an inventory cost of 2 per cent per month was considered to be a maximum possible inventory carrying cost (on the basis of an earlier study).

Sales Forecasting Studied As Market Change Indicator

The model and procedure described was geared to the company's then current requirements, which were relatively constant. Even now the demand is becoming variable. Can the procedure be modified so as to handle variable demand? It can be, providing a reliable prediction of sales is available and providing the precision of such estimates is known. For this reason we made an extensive study of sales forecasting. A number of methods using internal and external variables (published indexes) were subjected to comparative study. Our results were, I think, very complimentary to the company. An adjusted estimate based on the forecasts provided by the company's sales offices yielded best results in the sense that such an estimate is unbiased and has more reliability (less variance) than any of the many other methods tested. Furthermore, the errors of the estimates turned out to be normally distributed. This makes the estimates convenient to handle mathematically in scheduling equations.

Not only were we concerned with short range month-to-month forecasting for scheduling purposes, but we were also concerned with longer range forecasting for planning purposes, in particular, with forecasting changes in market trends. We were very surprised when we found a very sensitive indicator of changes in market. It consisted of applying a statistical quality control method to the market. Twelve actual net sales figures for each 90-day period beginning with the first day of each month of a year are plotted graphically. A trend line is fitted to these points by the method of least squares, and is projected ahead for another year. The standard deviation of the twelve points around the line are computed. Then two lines are drawn parallel to the trend line on both sides of it at a distance of two standard deviations from that trend line. Less technically, a band is drawn about the trend line such that if market variations were random one would expect approximately 95 per cent of the actual sales figures to fall within the band. Now as sales figures come in for each new 90-day period they are plotted. If one of these points goes above the band an improved trend is predicted, if below, a worse trend is predicted. This method was applied retrospectively over a number of years and not a single false prediction was noted. The method has been applied prospectively as well as retrospectively and has already correctly picked up a change in market trend.

There are other indications besides a point going outside the band which are useful. For example, if actual sales are a random variable, it is very unlikely that five consecutive figures will fall above or below the trend even within the band. Such an occurrence turns out to be a good indicator that a figure will shortly go outside the band.

A variation of the method just described was also developed which predicts changes in market trend with equal reliability, but on the average does so better than two months earlier. In this refinement, once the trend line is determined for the last twelve 90-day figures, the corresponding adjusted 90-day predictions prepared by the sales office were plotted about this line. Then the standard deviation of the predictions about the trend line is computed. The band limits are then drawn 3 of these standard deviations away on either side of the trend line. Subsequent predictions are then plotted, and the results are analyzed in the same way as is done in the first method. This method of predicting changes in market trends has since been successfully applied to another entirely different business.

Operation's Research—A Broad Approach To All Business Phases

Approval to begin conversion to economic lot sizes on one model of the turret lathe was given several months ago. The conversion is a difficult one involving many detailed problems and it is not being conducted in a vacuum. Other changes resulting from decisions made in the engineering and sales departments and from the regular changes in the shop are taking place at the same time. Even after conversion to the new method of scheduling is completed the exact computation of savings resulting will not be possible. This is especially true because one of the resulting benefits to be expected is an increase in control over the process which will permit of better coordination with the other types of change which accompany it in time.

While the conversion is going on the OR team is attempting to generalize the scheduling procedure to include production of repair parts. Here no forecasts are available and demand is extremely variable. Consequently, a fresh approach is required in this area.

I hope this report has given you some feeling for Operations Research and has impressed on you the breadth of its approach, its successive inclusion of more and more phases of an organizations operations in the study of any phase of these operations. It is this breadth which makes Operations Research such a useful management tool.

END

How Industry Is Using

SAM Rating Films

- **Reduce time, cost of time study training**
- **Select trainable applicants of Personnel**
- **Strengthen union's confidence in time study**
- **Reduce, expedite grievances**
- **Increase rating skill and consistency**
- **Build standard data**
- **Derive predetermined times**
- **Set new standards, audit old ones**
- **Explain philosophy of time study technique**
- **Help company make its own films**

ELEROY L. STROMBERG was Professor of Psychology at Western Reserve University from 1946 to 1953, and chairman of the Psychology Department from 1951 to 1953, when he left his teaching job to become Manager of Training and Personnel Research for the B. F. Goodrich Company, Akron, Ohio. Mr. Stromberg received his Ph. D. in 1937 at the University of Minnesota. He earned an M.A. from the University of Oregon, an A.B. from Nebraskan Wesleyan University. He has authored many articles and books on Psychology.

Let's Stop Wasting Brainpower

Eleroy L. Stromberg, Ph. D.
Manager, Training & Personnel Research
The B. F. Goodrich Company
Akron, Ohio

Not all work is physical. There are those who earn their livelihood by using their "brainpower." Indeed, our production system and our entire civilization are daily becoming more dependent on the effective utilization of this "brainpower." This article points out how we are wasting our greatest resource—our mental potential.

INDUSTRIAL Production specialists are always concerned with methods for increasing productivity in a work force. Their methods range from emphasis upon more unit hours of work, more effective utilization of machinery and equipment and more diligent adherence to scheduled hours of work and leisure. Their concern, of course, is the physical manpower requirement of industry today to meet our challenging productive needs. I suppose it would be possible for us to determine within close limits the number of manhours of time wasted every day by workers in industry who are not utilizing sixty seconds of every minute and sixty minutes of every hour. However, when such a survey was finished we would have at our fingertips only a remarkable story of how people today with less than full time utilization of their physical output have been able to out-produce all earlier generations, at the same time increasing their leisure time, their standard of living, and their general enjoyment of life itself.

An address to the Ohio State Safety Congress, Cleveland, Ohio.

But all work is not physical work. There is a tremendous number of people whose livelihood is earned through the utilization of what I have chosen to call "brain power." I do not wish to define brain power specifically since I think it might have a large number of definitions each of which would be entirely adequate within its own frame of reference. I shall refer rather to the more obvious, yet unrecognized, waste of mental resources which constitutes a constant and almost overwhelming hazard to American industry.

If we had such an easy task as that which confronts some of our governmental agencies in tabulating and appraising our manpower potential, we could turn the task over to a statistician who would search the census records and provide us with nearly accurate information on how many youths will reach the age of 18½ during this month, how many persons will begin to benefit from the old age security program, how many will be lost to industry by death and injury, and how many of these will find themselves either on or off the labor market in the next several weeks.

However, the task of the research man who attempts to appraise the mental resources of this nation is inestimable by comparison. We do not know exactly what the brain power potential of the citizenry of the United States is. We do have some indication, through our roster of scientific personnel, of those people who might be called "critical scientists." We have some indication through our professional societies of the number of individuals who have found it necessary and desirable to maintain a paid-up dues relationship for the purpose of being represented in the annual year book. However, your mental resources cannot be measured by these standards alone for there is a considerable difference between "raw brain power" and "trained brain power."

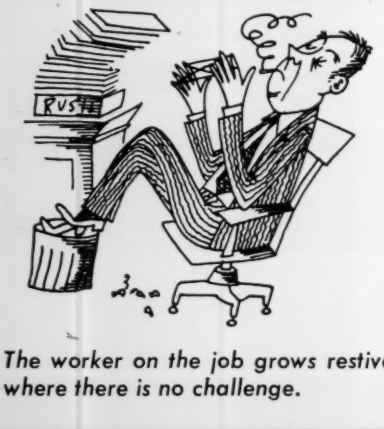
Only a small portion of our population has had the advantage of higher education, yet fully half of our population is capable of success in a college or university curriculum.

With each passing commencement program thousands of youths complete important milestones in their educational careers. Unfortunately, there is but a small proportion of those who are mentally qualified and capable who pursue their education to the full limits of their ability. Many of them are content to take a less rugged non-intellectual pathway and rely only on their physical resources for their livelihood.

Just how much brain power do we waste? There are roughly eight to ten million people of college age—that is, between the ages of 18 and 23. A recent study by Dael Wolfe points out that in a group of youths who were measured with an intelligence test in the sixth grade those who graduated from college represented a range of scores from slightly below the median to the top of the range. This, incidentally, was but a small proportion of the total group who were included in the original sixth grade study. Of the eight to ten million eligible youth let us say, then, that half of them are of college caliber. Far less than one half of them ever get to college. Out of every 1000 youth who enter high school 416 graduate. Of these, 146 enter college and 72 graduate. Mortality during college years places the graduation figures at about 50% of those who start college. This presents a rather dim picture, for it is apparent that we are not attracting to our universities, nor training in our universities, the mental resources which we have at our disposal.

If we are failing to train those who are mentally capable, to assume responsibility for management, inventiveness, leadership and science, then we are certainly wasting brain power. Perhaps one of the first reasons for this is that it has not been financially attractive for young men and young women to invest 4 to 6 years of their lives in a college course with the hopes that they will be able to achieve one of the limited number of adequately paying white collar management positions. The old studies of the economic value of a day in high school or a day in college have not been repeated recently probably because no one could justify the expenditure of mental energy, time, and money when the returns for this investment are so small.

The question which I should like to raise here is whether or not the kind of education which we had thought of as being a prerequisite to the statement "Hooray! I am educated!" is truly the kind necessary for the greatest utilization of our mental resources. I am confident that most industrial organizations like our own have upon their rolls individuals with tremendous mental reserves which have never been tapped primarily because we have decided, on an a priori basis, that a college diploma is a prerequisite for creative thinking and problem solving. I am certain that among the personnel who constitute our physical manpower resources there are many who, were they given the opportunity, could demonstrate to us that they are able to carry out many of the assignments which we now classify as "jobs for college graduates." This waste of brain power is one of the great detriments from which industrial management needs to free itself by recognizing that maturity, experience, and growing knowledge exist in every man and not alone in the college graduate.



The worker on the job grows restive where there is no challenge.

Industry Wastes Trained Personnel On Simple Jobs

Lest someone feel that I am arguing against university education, let me state clearly that having been a university teacher for over two decades I am thoroughly convinced of the value of university training. I feel, however, that in industry we have not competently utilized the educational background of many people, for we continue to burden college trained people with tasks which can be just as adequately carried out by those who have college ability but are without a college education. We are short of technically trained personnel, but we continue to use technically trained people in positions which neither challenge their mental capacity nor permit them to utilize to its fullest extent the university training which they have gained at a far from reasonable price.

There is a second point at which I am concerned with the waste of brain power, and that lies in the systematic approach to industrial jobs where we have for many years followed the principle of fractionation and simplification to the point that some industrial jobs become nothing more than automaton reactions. The worker on such a job grows restive for there is no challenge. He speaks of the monotony of his job and begins to search the labor market for a job elsewhere that will make greater use of his unused ability.

It is fortunate that some companies have recognized that when you fractionate and simplify a job to its finest elements it no longer represents a challenge to the well-educated person and that greater efficiency can sometimes be promoted through making the job more complex. This principle is known as job enlargement. It functions on the principle that an individual will find greater challenge, have greater satisfaction, and higher morale if his job amounts to something. Most companies that have tried it indicate that it has cut their costs, stepped up their output and has given the customer a better quality product.

As a result of several incidents in the plant of the International Business Machines they have practiced job enlargement in several departments during the past few years. It is their opinion that they have received in return for their efforts to enlarge responsibilities, greater productivity at lower costs. It is reported that General Motors has made studies of job enlargement with the result that they have tried to give life and challenge to some of the duller more repetitive jobs. The Detroit Edison Company is using the system with some of its clerical help. The Sears Roebuck Company, one of our country's biggest merchandisers, points out that it is their experience that where jobs are broken down too finely they are likely to have low output and low morale. It is apparent that wasted brain power is not found only among university graduates but is a common practice in many lines and levels of enterprise.

Conferences: Benefit Or Waste?

A third tremendous waste of brain power is that which is constantly occurring in our conferences, both industrial and social, where an enormous amount of argumentative time is certainly wasted. Irving J. Lee of Northwestern University reports in the Harvard Business Review the story of a former student of his who was seeking help in order to improve his management of a small manufacturing plant to which he had fallen heir. During their search for a method of handling difficult problems that arose, a plan was proposed which would limit the expenditure of argumentative time and thus con-

serve the mental energy and the individual time of all management participants.

Here, briefly, is the system which Mr. Lee proposes: When a conference reaches a point of impasse the chairman asks for a question of privilege. At this point the floor is given to a proponent of the view that has aroused the controversy. This proponent is invited to state or restate the position he has taken without interruption. No refutation or counter statement is permitted. Following his restatement three kinds of questions can be asked:

(1) Questions for clarification such as "What did you mean when you said . . .?" "Did you say . . .?" "You said . . ." "Did you mean this?" This type question forestalls the impulse to disagreement until after an attempt has been made to understand.

(2) The second type of question is one in which the participant may request information concerning the uniqueness of particular characteristics of the proposal or condition which is now under consideration. The listeners may not argue wherein they differ; they may only request information to help them examine.

(3) The third point is that no member may present criticism of the speaker's inference nor may he defend another idea. He may, however, ask questions of the third type: "How may the proponent's inferences be checked?"

Critical Thinking May Stifle Creative Thinking

While the system does not work as smoothly as some may have wished, there are certain advantages to this type of discipline. Anyone who has an idea can get a hearing. The opposition may not attack until it has undergone the discipline of asking questions. Members of this group found it possible to retire from a particular point of view with grace, and they felt assured that any idea which they wished to present would get a fair hearing. The general result of this system has been that the members of this group are now fighting problems and not fighting each other. A great portion of our mental resources can be wasted in a futile attempt to undermine and destroy another person when our energy ought to be spent in solving our problems.

A final area in which a great deal of brain power is being wasted will be found in the great tendency for people to be judicial in their thinking. Our educational system stresses critical thinking, and it is not healthy for a student to report on the work of some scientist or writer without at least a few comments about how he himself would have improved the experiment being reported. Industrial management has emphasized judicial thinking and has been quick to criticize the person who does not rapidly arrive at a judgment, sometimes concerning an area in which he knows little or nothing.

Negative Attitudes Depress Positive Thinking

Production people are expected, when they have been given a supervisory responsibility, to immediately become judges of the potentials of job applicants. Persons trained in administrative function have been expected to pass judgment upon ideas for product and equipment improvement. Many is the time an idea has died just after birth because a member of higher management has used his judicial prerogative and stated "we tried that twenty-two years ago." The idea which was not practical twenty-two years ago may represent the solution to a present day problem.

Recently I attempted a small experiment in which I divided a group of management people into two sections. One of these groups I called my "positive thinkers" and the other the "jury." I then suggested that the positive thinkers give me the solution to a problem which I consider very important. After making the best presentation of the problem that I could, I called on a member of the positive thinking group to tell me how he would solve the problem. The jury members were invited to state any doubts or questions, or negative ideas they might have about the solution presented.

The first gentleman stated his suggestions and was immediately barraged by members of the jury who knew that it would not work, that it was not practical, that it had been tried before, and that it did not make sense. After permitting these ideas to flow for five minutes I called on the second positive member. He then stated the solution to the problem and the jury overwhelmed him. After ten minutes had passed we had only two ideas and each of those was thoroughly beaten into the ground.

I then raised this question with the group; "Do you think I now have enough information upon which to proceed in the solution of the problem?" The answer was a unanimous "No." I then suggested that we take ten more minutes in which every one could present his positive thoughts concerning a solution to this problem, but no one was to be permitted any judicial statements. If a person presented an idea he at least felt it to be an important idea and no one of us was to be the judge. In the ten minutes which followed twenty-three solutions to the problem were suggested, and the group felt that we had ample room now to begin adequately solving the problem.

Three observations resulted from this little experiment. The first one is that although I had a board of twelve positive thinkers, only two of them were permitted to speak since the jury members were passing judgment upon the first two. Truly this was a waste of brain power. The second observation is that, given the freedom of expression, neither of the two men who had been so severely judged at the outset could make a single further suggestion for the solution of the problem. The final observation is that the group was much more congenial, had greater pleasure in their effort and felt a distinct sense of achievement when they were allowed to think creatively and no one passed judgment upon their ideas. This represents a tremendous waste of brain power for the judicial mind trained as it is to pass judgment attempts to analyze, to compare, to choose, and to reach an immediate verdict while the creative mind visualizes, imagines, foresees, generates new thoughts, and arrives at problem solving ideas.

I think there is something that can be done about this. Certainly we are in a position to better utilize the mental abilities of the personnel who have not been fortunate enough to graduate from college. If we again study the requirements of the man who has a certain job, we may find that he requires more of a challenging job to keep him happy and productive, whereas the fractionated, simplified task may leave him bored, disinterested, and anxious to move. We can avoid argument and the waste of argumentative time by some system, and we can put a stop to the emphasis on judicious thought and permit creativity to blossom. It is time for you to give your mental potential an opportunity.

END

APRIL CHAPTER MEETINGS

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Alabama	Industrial Relations	John S. Bugas	V. P., Ford Motor Co.	Tutwiler Hotel	12
Baltimore	Selling All the Way Through	Kenneth D. Lozier	V. P., St. Regis Paper Co.	Stafford Hotel	5
Binghamton	Joint Meeting with Industrial Council of Chamber of Commerce			Hotel Arlington	13
Bridgeport	Interpretation of Sales for Production Requirements	Donald G. Robbins, Jr.	Asst. V. P., Singer Manufactuing Co.		
	Who Controls Costs, the Accountant or the Industrial Engineer	John H. Venman John L. Schwab	John H. Venman & Co. John L. Schwab & Associates		20
Central Pa.	Trends in Collective Bargaining	A. B. Walton	Per. Dir., Owens-Corning-Fiberglas Co.	J. C. Blair Co., Huntingdon, Pa.	14
Cincinnati	Developing Cooperation in the Unionized Shop—Panel Discussion	George M. Harrison	Grand President, Brotherhood of Railway & Steamship Clerks, Frt. Handlers, Exp. & Sta. Employees	Hotel Alms—Marie Antoinette Ballroom	7
		Richard L. Siegel	Dir., Industrial & Pub. Rel., Gardner Board & Carton Co.		
Clearing	Controllers and Cost Accountants	E. A. Gustafson, Chairman		Clearing Industrial Club	20
	Communications in Industry			Bedford Park Community Center	20
Cleveland	Semantics—Foundation of Communications—Ladies Night	Warren Guthrie	Western Reserve U.	Hotel Allerton	4
Columbus	Evaluating Employee Performance			Hotel Fort Hayes	21
Dallas		Clarence J. Myers	President, New York Life Insurance Co.	Grand Ballroom, Adolphus Hotel	13
Dayton	Job Diversification	John Gower, Chairman			26
Fox Valley	Capitol Equipment Replacement	Thomas D. Lyons	Allis Chalmers Mfg. Co.		14
Georgia	The Role of Reassurance in Our Economy	Dr. Sidney Q. Janus	Consulting Psychologists, Inc.	Wilby Rm., Price Gilbert Library, Ga. Tech.	7
	Student Chapter Program				21
Greensboro	Plant Visitation			Vick Chemical Co., Cough Drop Plant, Greensboro	7
	Operations Research—Practical Use For Management			Plantation Supper Club	19
Greenville	To Be Announced			Hotel Greenville	13
Hudson Valley	Case Histories in Operations Research Techniques	Prof. George E. Kimball	Chemistry Dept., Columbia Univ.	Hendrick Hudson Hotel, Troy, N. Y.	7
	Aptitude Testing Techniques —Panel Discussion	Murray R. Nathan, Chairman	N. Y. State Dept. of Health	Rensselaer Polytechnic Institute Troy, N. Y.	21
		Harold N. Chamberlain	R.P.I.		
		Philip Hollis	West Virginia Pulp & Paper Co.		
Indianapolis	Spring Conference			Marott Hotel	14
Kansas City	Overhead Control			Town House	19
Knoxville	Economic Education for Employees	Robert L. Laws	S.A.M.	Holston Hills Country Club	12
	Plant Visitation			Southern Railways John Sevier Yard	21
Lancaster	What the Boss Hopes to Find	Arthur C. Horrocks	Public Relations Counsel, Goodyear Tire & Rubber Co.	Yorktowne Hotel, York, Pa.	19

APRIL CHAPTER MEETINGS

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Lehigh Valley					12
Madison	Role of the Executive Wife	Dr. Paul Mundie		Leske's Steak House	6
Milwaukee	Management Selection and Development	F. L. Larkin	V. P., The Electric Company	E. S. M. Building, 3112 W. Highland Ave.	14
Montreal	Salary Evaluation to Increase Management Effectiveness	R. H. Grant	J. D. Woods & Gordon	Ritz-Carlton Hotel	13
Nashville	Satisfactory Union-Management Relationships				14
New Haven	Industrial Engineering Round Table				13
	Increasing Productivity Through Capital Expenditures	Bruce Payne	Bruce Payne & Assoc.	Colonial House, Hamden, Conn.	21
	Industrial Relations Round Table			Bd. Rm., New Haven Chamber of Commerce	27
New York	Automation	John Diebold	Editor, Associate Publisher, Automatic Control	Hotel Shelton	21
New Orleans	Management's New Frontier: Material Handling	R. H. Davies	V. P., Clark Equipment Co.	Roosevelt Hotel	12
Northeastern Pa.	Wage Incentives as They Are Applied to the Material Handling Problem	William C. Conover	Ch. Ind. Engr., Johnson & Johnson		4
Philadelphia	How to Lose Your Shirt in Labor Arbitration	Thomas Kennedy	Dir., Ind. and Public Relations, Atlas Powder Company	Poor Richard Club	5
	Frontiers in Industrial Relations	Hiram S. Hall	Wallace Clark & Co.		
	Ideas, Rewardable or Expected Under Job Descriptions			Atlantic Refining Co.	12
	Interviewing			Atlantic Refining Co.	26
Pittsburgh	Boss Man	George Landis	V. P., Engineering Lincoln Electric Co.	Gateway Plaza	21
Portland	Dinner Meeting				27
Providence	Quality Control	Prof. Mason Smith		Johnson's Hummocks	7
Raritan Valley	Seminar and Dinner Meeting "Communications In Industry"	Edward Schulz, Moderator Daniel Rockford	Per. Dir., R.C.A. Laboratories Advisor for Management and Employee Communications, Standard Oil of N. J.	Roger Smith Hotel, New Brunswick, N. J.	20
Trenton	Are We Coddling Labor —Debate	Charles A. Jurgensen, Moderator	V. P., Manuf., De Lavel Steam Turbine Co.		19
		Affirmative—To Be Announced			
		Negative—Leon E. Kornbleet	Per. Mgr., Stokes Molded Products		
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	American Manager Abroad			Archives	7
	Statistics for Management Use			Archives	11
	Scientific Management in Home			Lafayette Bldg., Rm. 1141	11
	Financial Management			GAO Bldg., Auditorium	19
Western North	Don't Work Harder, Work Smarter	Don Copell	V. P., Wagner Baking Co.	George Vanderbilt Hotel, Asheville, N. C.	13
Wilmington	To Be Announced				12
Worcester	Management Inventory and Development	Bernard J. Rahilly	Ind. Rel. Dir., Chicopee Mfg. Corp. of Georgia	Hickory House	18

New Management Writing . . .

CENTRALIZATION VS. DECENTRALIZATION in organizing the Controller's Department

By Simon, H. A., Guetzkow, H., Kozmetsky, G., and Tyndall, G. Controllership Foundation, Inc., New York. 106 pages. $6.00.

This volume is a report on a research project undertaken by staff members of the Graduate School of Industrial Administration of the Carnegie Institute of Technology, assisted by the Controllership Foundation. It is a six-chapter book, and the first to deal exclusively and rather extensively with the organization problems of the controller's department. The publication is somewhat unique in that it directs attention to the day-to-day relationships between controllers and operating executives, as well as to the degree and kind of communications between individuals. This is a change from the usual emphasis on the common line and staff relationships.

The book, written in easily understandable terms, is well summarized in the first chapter. Subsequent chapters deal with the various elements of the subject. Chapter 2 states the problem, namely how far should decentralization be carried in the controller's department so as to reach maximum effectiveness. The tests by which to judge such effectiveness include the provision of high quality information services at a minimum cost, while developing accounting and operating executives.

Centralization and decentralization are defined, and involve the degree to which discretion and authority to make important decisions are delegated from the management to division, factory and departmental executives. The degree of centralization or decentralization of a controller's department were found to depend on at least five factors:

(1) Structure of accounts and reports. (2) Geographical location of the accounting functions and operations. (3) Formal authority relationships. (4) Personal loyalties. (5) Channels of communication.

The third chapter reviews the principal findings concerning the use or nonuse of accounting data by operating executives. Executives at various management levels use accounting data to help in answering: (1) "Score-card" questions—How am I doing? (2) "Attention-directing" questions—What needs looking into? (3) "Problem-solving"—What's the answer to major problems, policy determination, alternatives?

The authors devote chapters 4 and 5 to the organization problems in the effective use of the accounting—compiled information. The conclusions may be summarized as follows:

(1) Effective accounting service requires the *separation* of the personnel and units responsible for each of these functions:
   (a) Bookkeeping and preparation of routine reports.
   (b) Assistance to departments in analysis of current data for score-keeping and attention-directing uses.
   (c) Participation in special studies.

(2) *Decentralization* of record keeping probably offers the best basis for the record keeping function inasmuch as accessibility of documents is an important criterion.

(3) In the use of accounting data for current analysis, good *communication* is the heart of the problem, and perhaps decentralization offers the best basis.

(4) Special studies call for more *centralization* than either record keeping or current analysis. This function is best served through *teams* that include staff assistants to operating executives.

(5) A suggested plan of organization which recognizes the above conclusions is
   A. General accounting.
   B. Sales accounting.
   C. Cost planning and analysis.
   D. Special studies.
   E. Internal auditing.

The final chapter deals with personnel development, including comments on the effect of organization lines on normal avenues of promotion.

The book has been written as a report to controllers, and there are many practical, tested suggestions applying to the accounting organization. However, the book can make a contribution to anyone who has a centralization-decentralization problem regardless of where it is. It should be useful to most business executives.

James D. Willson, Treasurer
Affiliated Gas Equipment, Inc.
Cleveland, Ohio

A Biography of The Life And Times Of A Happy Liberal: Morris Llewellyn Cooke

By Kenneth E. Trombley. Published by Harpers & Bros., 270 pps. $4.00.

Biography, at its best a volatile mixture of fact and fiction, has always been a difficult form of literature. It is doubly difficult when the subject of the biography is alive. First, facts are recalled with differing emotions by his contemporaries. Any statement is open to challenge. Second, the subject himself checks the biographer's imagination.

This biography of Morris Cooke, a contemporary of Frederick Taylor, tries to meet these difficulties by attempting impartiality. Unfortunately, impartiality has been confused with impersonality.

The book marches through newspaper excerpts, congressional committee hearing records and publicity releases. Much space is given to the establishment and development of the Rural Electrification Administration. The reason for this is unveiled in the last chapter. Cooke says that R.E.A. heads the list of his accomplishments and personal interests.

Cooke, the man, is lost under a crazy quilt of events. He is displayed as a vigilante, an eloquent pamphleter, a hard-headed engineer, a versatile diplomat and a champion of government for the people. That he was extraordinarily happy or unusually liberal are difficult qualities to infer from this book. This is not to challenge the personality of Cooke. It is to say, however, that Cooke does not come completely alive from the pages of this book. Insight into Cooke's character is hard to come by.

There is much in this book about the times of Morris Cooke but not enough about his life. EXT

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